

STRUCTURE OF THE MICROCARD (BASIC INSTRUCTIONS)

A02 = How to use the microcard

A01 = Structure of microcard

B01 = Trouble-shooting chart

N01 = Service Information

1

2

3

4

SIS

A-\*\*\*X\* X\*XXX XXXXX XXXXX \*XXXX X

B-\*XXXX XXXXX XXXXX XXXXX XXXXX XXX

C-XXXXX XXXXX XXXXX XXXXX XXXXX XXX

D-XXXXX XXXXX XXXXX XXXXX XXXXX XXX

E-XXXXX XXXXX XXXXX XXXXX XXXXX XX

F-XXXXX XXXXX XXXXX XXX

G-XXXXX XXXXX XXXX

H-

J-

K-

L-

M-

N-\*XXXX XXXXX XXXXX XXX XX XX\*

12345 67890 12345 67890 12345 678

1

2

Index

N28 = Table of contents and publication information

1 = Special features

2 = Safety and precautionary measures

3 = Test equipment and tools

4 = Installation position of components

a. Read from left to right.

b. Title of micropicture (appears on each coordinate).

E16

Product/component/test step

Coordinate

c. Limits of section

Beginning

Mid-section

End

One-page section

A01

=> <=

HOW TO USE THE MICROCARD

Trouble-shooting instructions for system:  
Electronic ignition with knock control (EI-K)

Descriptions, photographs, terminal designations and special features refer to the vehicle:

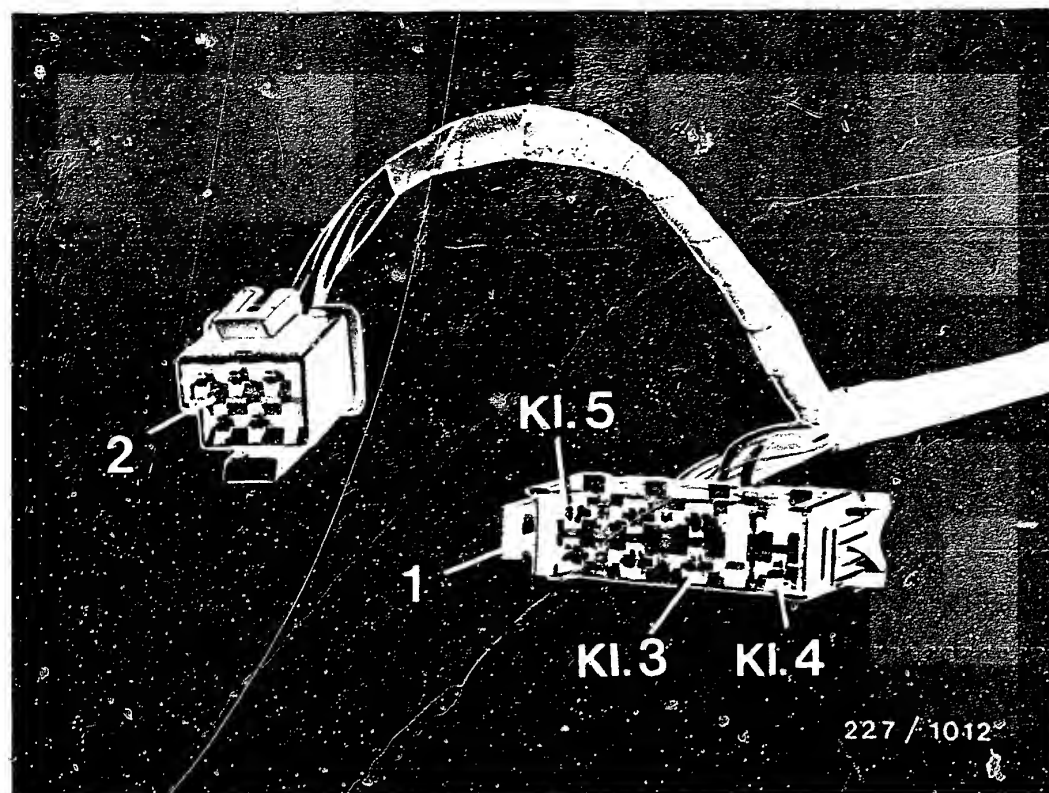
Audi 100, with 2.3 l engine, 5 cylinders, 100 kW  
Code letter NF, year of manufacture 1986->

These basic instructions are detailed trouble-shooting instructions. They must not be used as vehicle-specific instructions.  
Attention! Descriptions and photographs may deviate from those in the vehicle-specific brief instructions.

Binding set values, terminal assignments and special features must be taken only from the vehicle-specific brief instructions.  
For brief instructions, see Table-of-Contents microcard KFZ-00..

A02

=> <=



1 = Variant coding (EI-K)  
2 = Parameter coding (KE-Jetronic)

#### SPECIAL FEATURES

Depending upon the switching of the encoding plug, various characteristic maps can be selected in the EI-K control unit.

On this vehicle, the variant encoding plug is not connected.

This leads to the following coming into effect:

At greater than 65° °C (coolant), advanced characteristic map (no. 1).

At less than 65° °C (coolant), retarded characteristic map (no. 2).

For production reasons:  
continued on the following  
coordinate.

## SAFETY AND PRECAUTIONARY MEASURES

Danger of accident on semi-conductor ignition systems.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led sometime ago to manufacturers starting to equip their vehicles with semi-conductor ignition systems as original equipment.

In most cases, the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" components or terminals (whether on the primary side or the secondary side) can prove fatal. In this connection, we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

## SAFETY AND PRECAUTIONARY MEASURES (continued)

The ignition system should always be switched off when working on the ignition system (switch off ignition or voltage source).

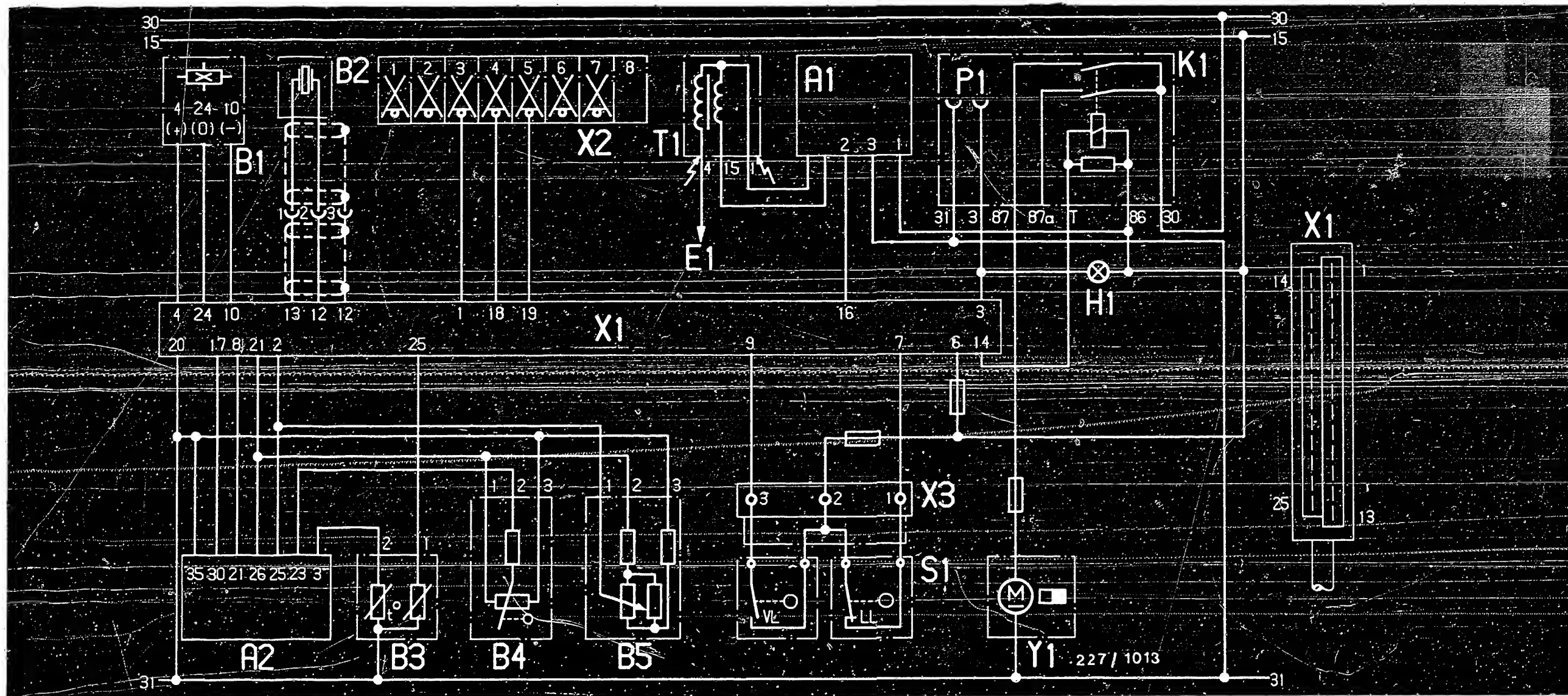
Such work includes:

Connecting of engine test equipment (timing strobe, dwell-tach tester, ignition oscilloscope etc.).

Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, H.T. ignition cables etc.).

If, while testing the ignition system or during adjustment work on the engine (e.g. carburetor), it becomes necessary to switch on the ignition (switch on the ignition or voltage source), the above-mentioned dangerous voltages occur throughout the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.



High-voltage arrows: Danger 400 V...25 kV

A1 = Trigger box  
 A2 = KE-Jetronic control unit  
 B1 = Magnetic pulse generator  
 B2 = Knock sensor  
 B3 = Coolant-temperature sensor  
 B4 = Air-flow sensor (potentiometer)  
 B5 = Altitude sensor  
 E1 = To ignition distributor  
 H1 = Fault lamp

K1 = Electric-fuel-pump relay  
 P1 = Contacts for diagnosis  
 S1 = Throttle-valve switches  
       idle/full load  
 T1 = Ignition coil  
 X1 = EI-K control-unit plug  
 X2 = Encoding plug  
 Y1 = Electric fuel pump

The dangerous locations are marked with high-voltage arrows taking the example of the terminal diagram of an electronic ignition system.

SAFETY AND PRECAUTIONARY MEASURES  
(continued)

During the compression test, either pull off the trigger-box plug or firmly connect terminal 4 of the ignition coil to ground using an extra cable (dangerous voltages, insulation damage at ignition coil, ignition distributor, ignition harness).

Note:

The extra cable must be suppressed with at least  $2\text{ k}\Omega$ , e.g. with sleeve-type suppressor ( $5\text{ k}\Omega$ ) 0 356 500 001.

Never start the engine without the battery securely connected (battery terminals tightened). Do not disconnect battery from vehicle electrical system with engine running.

Do not use a fast charger for starting the engine. Provide starting assistance only with a second 12 V battery and jump leads.

Caution! Owing to non-standardized requirements of vehicle manufacturers with regard to electronic products, we advise against using a 24 V battery for starting assistance.

When charging the battery in the vehicle or when providing starting assistance, follow the operating instructions for the fast charger as well as the instructions of the vehicle manufacturer.

Disconnect the battery from the vehicle electrical system before charging or fast-charging.

SAFETY AND PRECAUTIONARY MEASURES  
(continued)

Incorrect polarity of the supply voltage, e.g. through incorrect connection of battery, may lead to the destruction of the magnetic pulse generator, trigger box and ignition coil, as well as a control unit.

Do not connect or disconnect wiring-harness plugs from control units or trigger boxes with the ignition on.

Remove control units at temperatures exceeding  $+80^{\circ}\text{C}$  (paint-drying installation).

Remove control units before carrying out electric welding work.

Perform resistance measurements only with ignition switched off or battery disconnected (measuring instrument defective).

The specified ignition coil (see Part no.) must not be replaced by a different ignition coil.

Do not connect a suppression capacitor to ignition coil term. 1.

Ignition coil terminal 1 must not be brought into contact with ground as a theft-prevention measure (ignition coil will be destroyed when ignition is switched on).

No battery + and no test lamp may be connected to ignition coil terminal 1 (trigger box will be destroyed).

SAFETY AND PRECAUTIONARY MEASURES  
(continued)

Ignition coil from ignition coil terminal 4 to ignition distributor terminal 4 must not be disconnected during operation.

There must be no arcing from ignition coil terminal 4 to ignition coil terminal 1 and terminal 15. The trigger box may be destroyed.

In order to prevent the trigger box from being irreparably damaged, the secondary side of the ignition system must have at least 2 k  $\Omega$  interference suppression, whereby the original distributor rotor with 1 k  $\Omega$  interference-suppression resistor must be fitted.

No external voltage, e.g. ohmmeter, may be connected to the magnetic pulse generator (Hall generator).

CAUTION WHEN SWITCHING MEASURING RANGES!

The holding springs of the distributor cap must not drop into the pickup system when the engine is being cranked and with the dust-protection cover removed.

Arcing or breakdown of insulation on the distributor cap (poor insulation) may lead to the destruction of the magnetic pulse generator and EI-K control unit.

SAFETY AND PRECAUTIONARY MEASURES  
(continued)

The knock-sensor leads must be shielded and laid separately from high-voltage cables.

Install the knock-sensor fastening screw without plain washer, spring lock washer, tooth lock washer etc. .  
Secure the fastening screw only with locking paint.

Incorrect indication of engine speed, dwell angle and ignition point:

in the case of this ignition system (trigger box with current limitation), incorrect indication of engine speed, dwell angle and ignition point at tester may occur.

For more detailed information, see Coordinates N10...N14.

# TEST EQUIPMENT AND TOOLS

Motortester e.g.	MOT 201	0 684 000 201
5 k $\Omega$ sleeve-type suppressor		0 356 500 001
Ohmmeter or e.g.	ETE 014.00 Pontavi Wh 2	0 684 101 400 Commercially available
Voltmeter e.g.	ETE 014.00	0 684 101 400
Protractor		KDJE 7462
Test leads (for proper connection of testers to connectors).		KDZS 0004 KDZS 0005
Test prod, black		1 684 485 034
Test prod, red (for proper connection of testers and connectors).		1 684 485 035
Screw locking paint	30 g	5 703 245 003
Torque wrench 5...60 Nm		Commercially available
Feeler gauge		Commercially available

For production reasons:  
continued on the following  
coordinate.



## INSTALLATION POSITION OF COMPONENTS

The EI-K control unit is located in the footwell on the driver's side.

See upper illustration, Item 1.

The altitude sensor is located above the EI-K control unit.

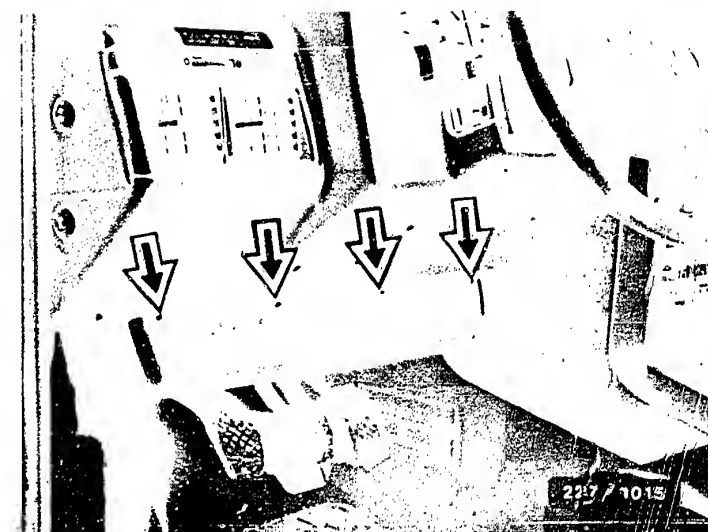
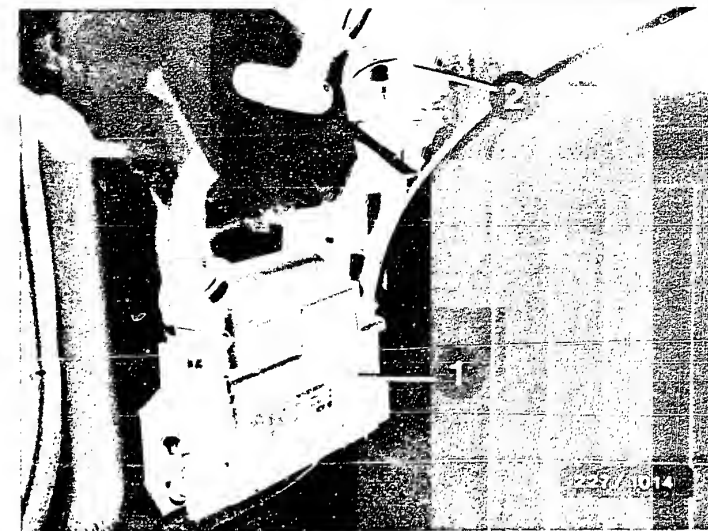
See upper illustration, Item 2.

### Note on removal:

Remove tray compartment. See center illustration, arrow.

Unscrew the engine-hood unlatching device and remove the panel of the EI-K control unit.

See lower illustration, arrows.





## INSTALLATION POSITION OF COMPONENTS (continued)

The KE-Jetronic control unit is located in the footwell on the passenger's side.

See upper illustration, Item 1.

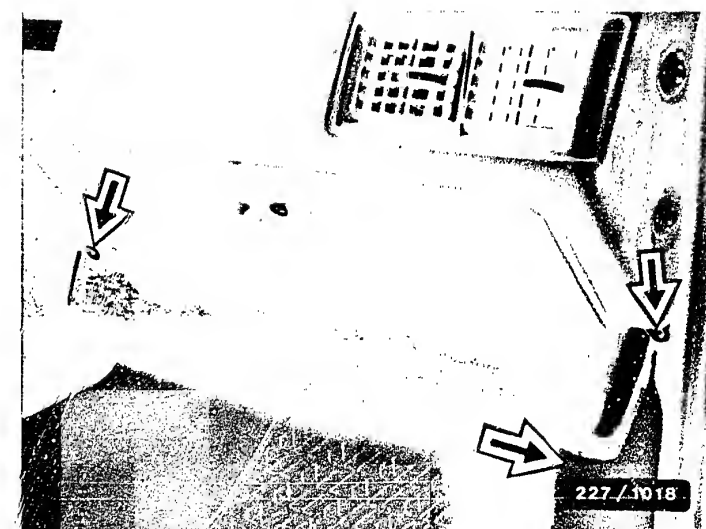
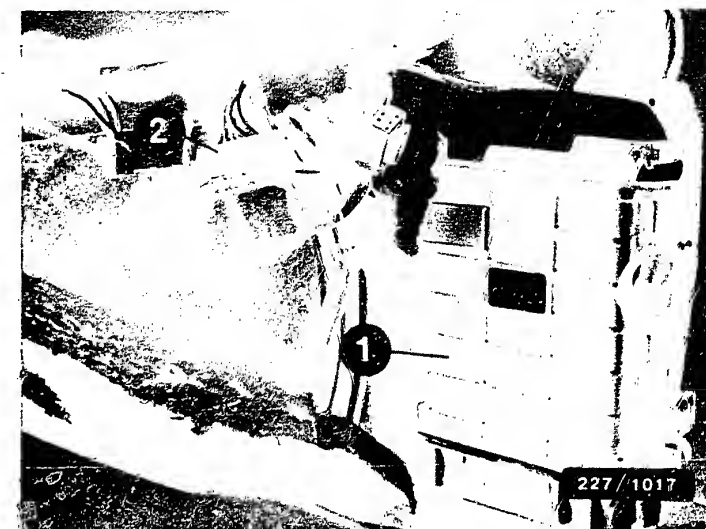
The variant coding is located in a plastic sleeve near to the KE-Jetronic control unit.

See upper illustration, Item 2.

### Note on removal:

Remove the tray compartment and covering of the KE-Jetronic control unit.

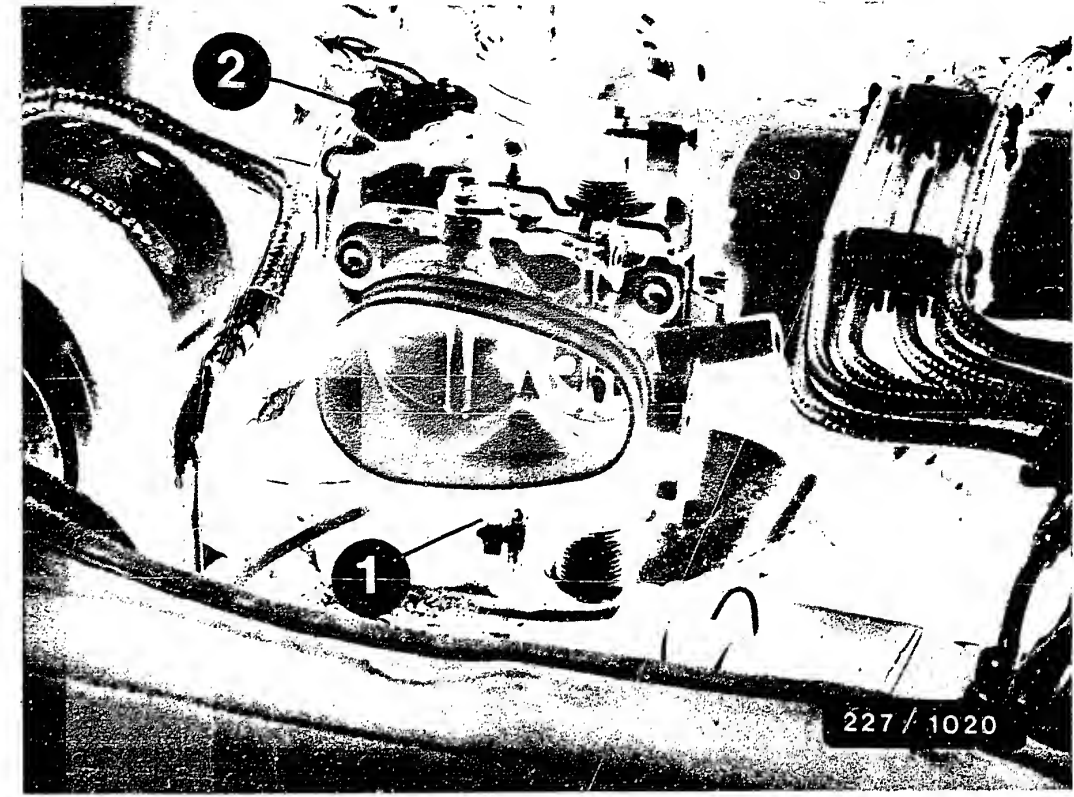
See lower illustration, arrows.





Arrow = Coolant-temperature sensor.

INSTALLATION POSITION OF COMPONENTS (continued)



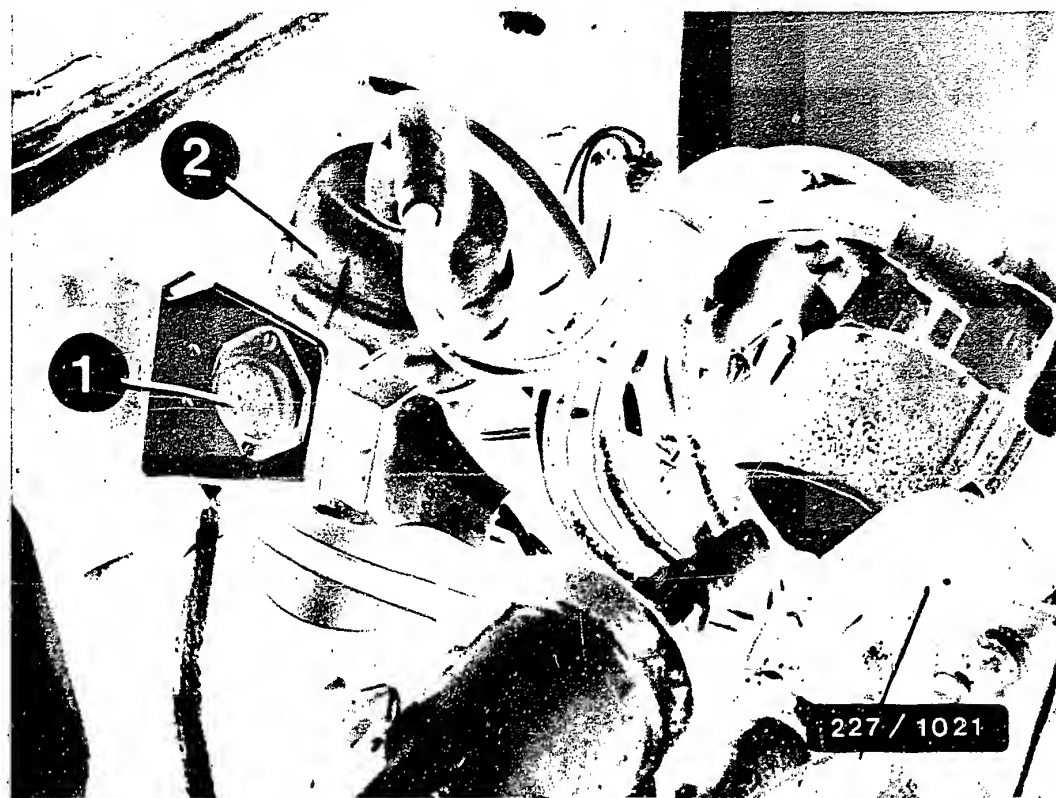
1 = Throttle-valve switch - idle

2 = Throttle-valve switch - full load

INSTALLATION POSITION OF COMPONENTS (continued)

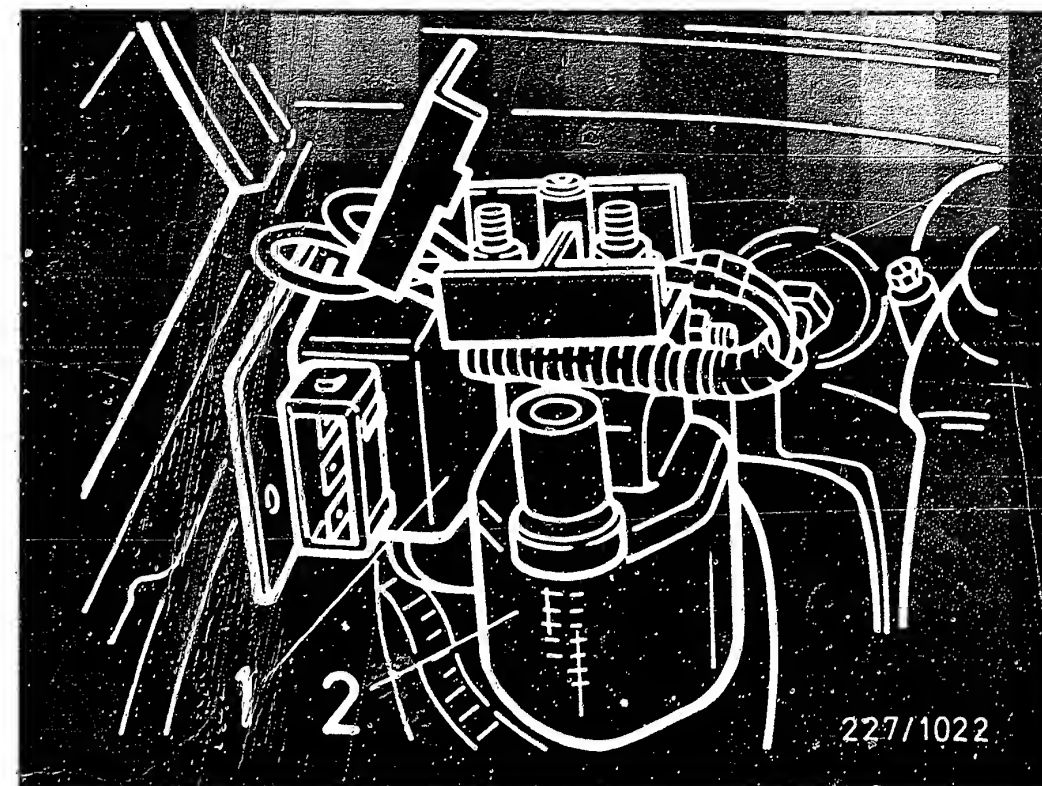
N o t e

If a defect is found at the idle switch or full-load switch, always replace and adjust both switches.



- 1 = Trigger box  
2 = Ignition coil

INSTALLATION POSITION OF COMPONENTS (continued)



- 1 = Trigger box (non-Bosch product)  
2 = Ignition coil (non-Bosch product)  
1, 4, 15 = Terminal assignment, ignition coil

INSTALLATION POSITION OF COMPONENTS (continued)



Arrow = Knock sensor

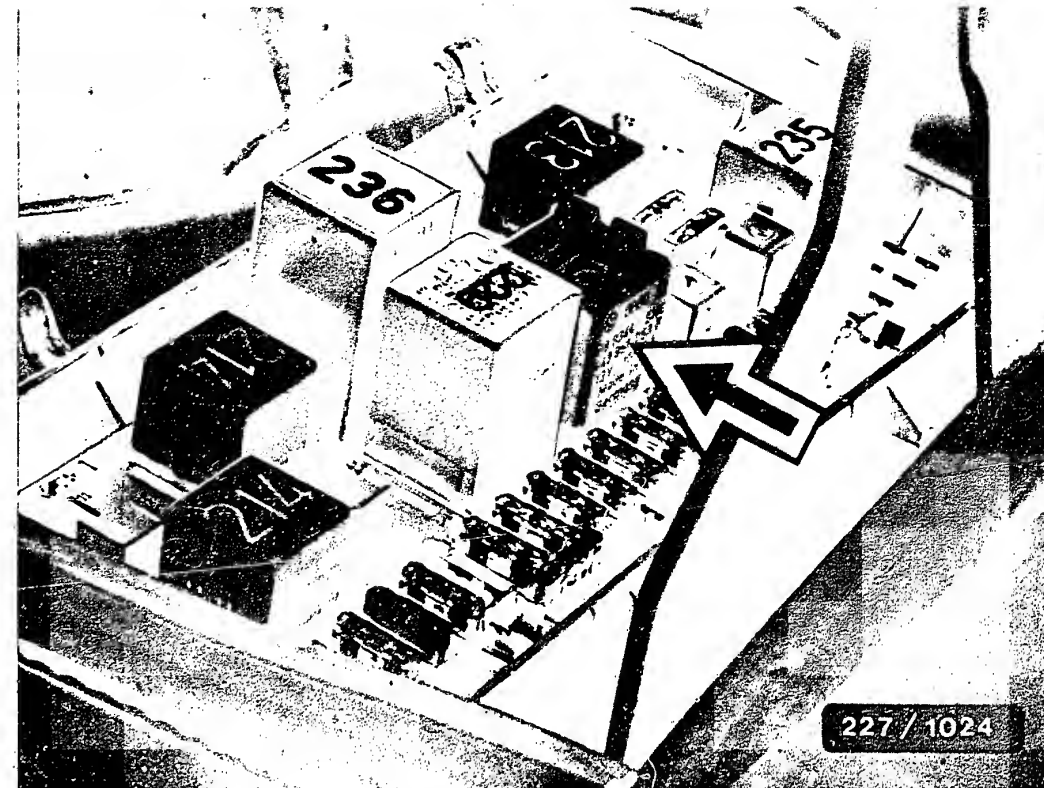
#### INSTALLATION POSITION OF COMPONENTS (continued)

The knock sensor is located near to the left-hand engine support member.

N o t e

Mount the fastening screw of the knock sensor without plain washer, tooth lock washer, or similar.

Secure the fastening screw only with locking paint.



Arrow = Electric-fuel-pump relay

#### INSTALLATION POSITION OF COMPONENTS (continued)

## INSTALLATION POSITION OF COMPONENTS (continued)

The fault lamp is located in the instrument cluster.  
See upper illustration, arrow.

### Note on removal:

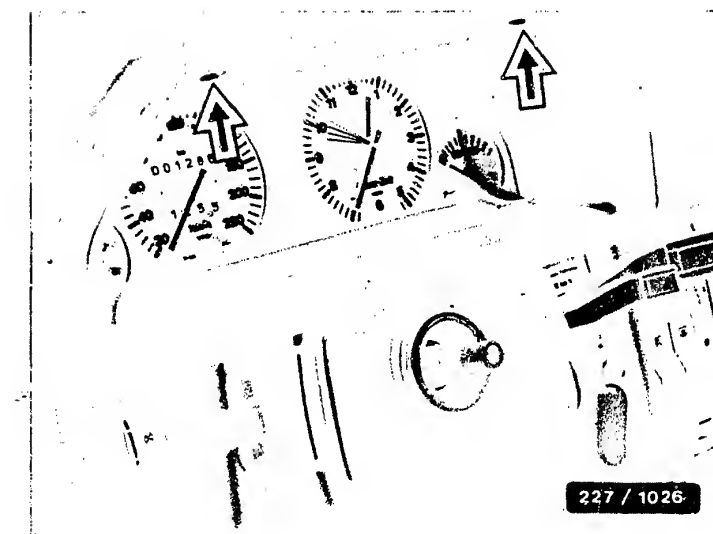
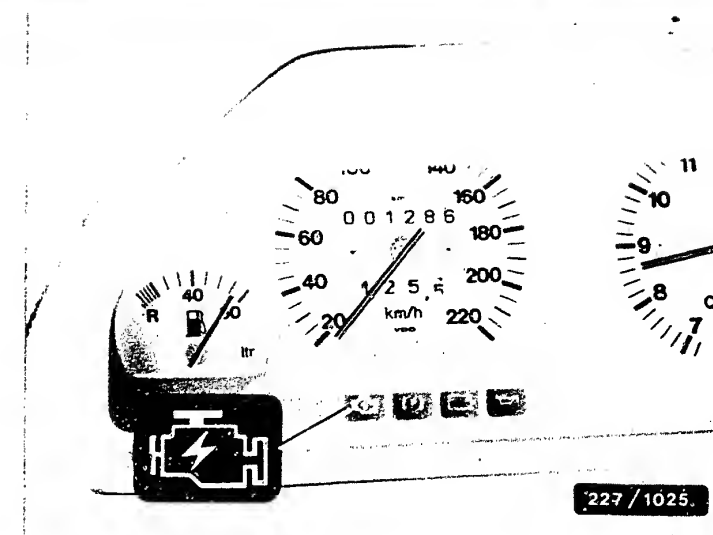
Pull off the cap from the steering wheel by hand (lug connection). Unscrew the securing nut of the steering wheel and remove the steering wheel.

Steering-wheel installation: tightening torque 40 Nm.

Unscrew the mounting of the instrument cluster.

Pull out the instrument cluster (plug connection).

See lower illustration, arrow.



## USING THE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING CHART starts on Coordinate B07 and contains customer complaint (symptom of fault/fault characteristic) with several possible causes (component faults) in each case as well as coordinate references for detailed trouble-shooting. If no Coordinate reference is given, it is a cause for which test instructions are not required.

Components which are tested by self-diagnosis or with universal test adapter are not listed in the trouble-shooting chart.

If the customer complaint has been clearly diagnosed, perform trouble-shooting in the given order of the possible causes, one after the other and step by step.

Always start trouble-shooting with the self-diagnosis (if applicable) or with the universal test adapter (if applicable). Only then continue according to the trouble-shooting chart.

If the customer complaint has not been clearly diagnosed, check all the causes listed in the trouble-shooting chart. To prevent possible incorrect measurements, check all causes in the order given (because of the interlinking of test steps).

## USING THE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (continued)

If the customer complaint has still not been eliminated after testing all the possible causes, then TRY installing a new, specified ignition coil and/or trigger box/control unit.

The TROUBLE-SHOOTING PROGRAM contains all system and component checks mentioned in the trouble-shooting chart. The program is divided into three rows of boxes.

The left-hand column contains test instructions and set values.

The center column contains information on trouble-shooting and how to rectify the fault.

The right-hand column contains the illustrations/terminal diagrams belonging to the text, together with explanations.

If the questions in the left-hand column can be answered conclusively with "yes", continue trouble-shooting with the next box down.

If the answer to the questions is "no", branch to the center column and carry out the tests in the order given there.

After rectifying a fault, repeat the test as a check.



USING THE TROUBLE-SHOOTING CHART AND  
TROUBLE-SHOOTING PROGRAM (continued)

TEST REQUIREMENTS:

- Battery fully charged
- Engine mechanically O.K.  
(e.g. compression, valve clearance etc.)
- Engine at normal operating temperature, approx. +80°C  
(if necessary)
- Correct seating of all connectors of wiring  
harness
- Fuel system O.K.

USE OF SELF-DIAGNOSIS, SELF-DIAGNOSIS TEST  
TABLE, AND SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM

The control unit installed in this vehicle  
incorporates self-diagnosis. For this reason,  
trouble-shooting must start with  
self-diagnosis.

Activation of self-diagnosis is  
described starting on Co-ordinate B13.  
The self-diagnosis test table starting on B17  
includes:

- Fault indication (flashing code)
- Components or system functions  
inspected
- Test instructions/conditions
- Connection terminals
- Set-value information
- Co-ordinate information for trouble-shooting and  
elimination in the subsequent self-diagnosis  
trouble-shooting program.



USING THE SELF-DIAGNOSIS, SELF-DIAGNOSIS  
TEST TABLE AND SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM  
(Continued)

The self-diagnosis trouble-shooting program is divided into three columns starting at Coordinate B15.

The left-hand column contains test instructions and set values.

The center column contains information on trouble-shooting and on how to rectify the fault.

The right-hand column contains the illustrations/terminal diagrams belonging to the text, together with explanations.

If the questions in the left-hand column can be answered conclusively with "yes", continue trouble-shooting with the next box down.

If the answer to the question is "no", branch to the center column and carry out the tests in the order given there.

After rectifying a fault, repeat the test as a check.

If the self-diagnosis indicates a fault, but no system fault or component fault was found during trouble-shooting, try replacing the control unit.

If no more fault is indicated in self-diagnosis and the customer complaint has still not been eliminated (symptom of trouble), continue trouble-shooting with the trouble-shooting chart starting at Coordinate B07.

USING THE SELF-DIAGNOSIS, SELF-DIAGNOSIS TEST TABLE  
AND SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM  
(continued)

Test requirements:

- Engine can be turned over by the starting motor.
- Fault lamp must light when ignition ON.

## TROUBLE-SHOOTING CHART

Customer complaint (symptoms of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Rough idling (engine speed, exhaust gas).
4. Poor throttle response, flat spot during acceleration.
5. Engine misfiring (ignition, fuel injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

											Cause (Component fault)	Coord.
*	*	*	*	*	*	*	*	*	*	*	Self-diagnosis	B09
*			*								High-voltage side	C15
*			*								Ignition coil	C17
*											Firing sequence	—
*											Voltage, EI-K control unit	C19
*											Ignition-distributor plug and socket	C21
*											Voltage, magnetic pulse generator	C23
*											Magnetic pulse generator, operation	C25
*											EI-K control unit, operation	C27
*											Voltage, trigger box	D03
*											Primary signal	D05
*											Actuation, electric-fuel-pump relay	D07

## TROUBLE-SHOOTING CHART (continued)

Customer complaint (symptoms of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Rough idling (engine speed, exhaust gas).
4. Poor throttle response, flat spot during acceleration.
5. Engine misfiring (ignition, fuel injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

										Cause (Component fault)	Coord.
*										Contact resistance	D09
*										Ignition distributor - installation adjustment	D11
							*			Fault lamp	D13
*			*	*		*	*	*		Basic ignition setting	D17
			*							Voltage, EI-K control unit	D21
			*							Voltage, ignition coil	D23

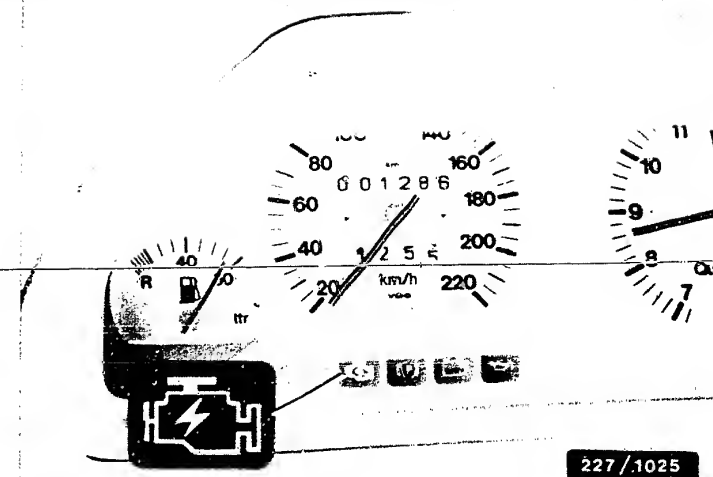
## SELF-DIAGNOSIS

### General

EI-K and KE-Jetronic control units are equipped with self-diagnosis in the form of a flashing code. This is indicated by the fault lamp in the instrument cluster. See illustration, arrow.

Only flashing codes of the EI-K are listed in the following self-diagnosis test table.

For the flashing codes of the KE-Jetronic, see the corresponding microcard.



# SELF-DIAGNOSIS (continued)

## Evaluating the flashing code

The flashing code comprises 4 groups of flashing pulses, each with a maximum of 4 flashing pulses.

After the start signal (fault lamp on) and a following pause (fault lamp off), each of approx. 2,5 seconds, the flashing pulses are transmitted.

Between the groups of flashing pulses, there is a pause (fault lamp off) of approx. 2,5 seconds.

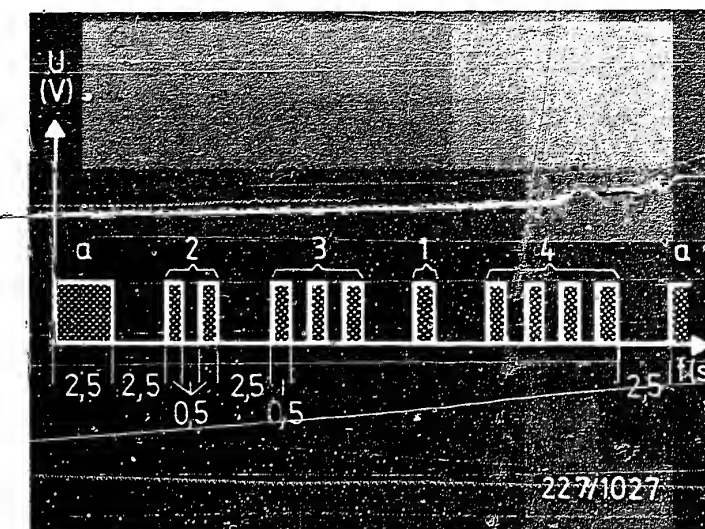
After the 4th group of flashing pulses has been transmitted, there is a pause of approx. 2,5 seconds.

By adding up the individual flashing pulses in each group of flashing pulses, you arrive at a number between 1 and 4.

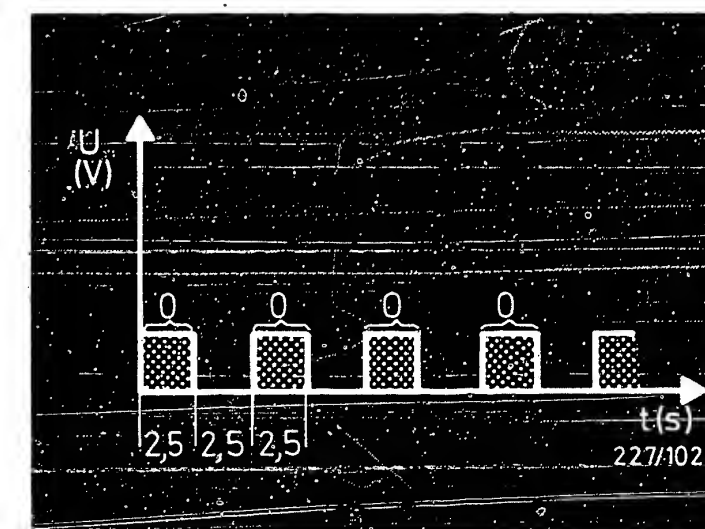
The upper illustration shows as an example the flashing code 2 3 1 4.

After the total contents of the fault memory have been output or after the flashing code 4 4 4 4 (no fault detected), the flashing code 0 0 0 0

(end of fault output) is indicated by flashing pulses or flash pauses of equal length being repeated. See lower illustration.



Note: Gridded area means fault lamp ON.  
a = Start signal (start of transmission of appropriate flashing code).



## SELF-DIAGNOSIS (continued)

### Activating the self-diagnosis

Perform a test drive of at least 5 minutes (until the coolant temperature is greater than 65° °C on the road/roller-type test stand at an engine speed greater than 3000 min<sup>-1</sup>).

In the process, briefly fully depress the accelerator pedal to the floor, or if the engine does not start, actuate the starting motor for approx. 6 seconds.

Do not switch off the ignition.

When the ignition is OFF, the contents of the fault memory of both control units are cleared.

Bridge the contacts at the electric-fuel-pump relay with a fuse for at least 4 seconds – at an engine speed below 2000 min<sup>-1</sup>.

See illustration, arrow.

Note: during and after the activation phase, no further faults are accepted in the fault memory.

The flashing code now indicated is noted down by the person testing. Beginning with the start signal, the respective flashing code is repeated until the next fault in the EI-K control unit is called up by bridging the contacts at the electric-fuel-pump relay once more.

The contacts continue to be bridged until the flashing code 0 0 0 0 (end of fault output) appears.

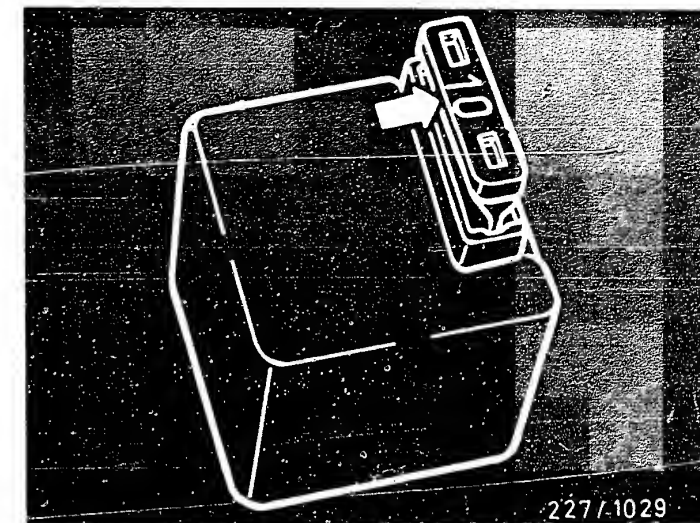
If all the faults (EI-K control unit) are indicated once again, an engine speed of 2500 min<sup>-1</sup> must be briefly exceeded.

Afterwards, reactivate the self-diagnosis. After eliminating the faults, take the vehicle for a test drive and then activate the self-diagnosis.

### N o t e:

If the electric-fuel-pump relay is bridged once again after the flashing code 0 0 0 0 (end of fault output), the contents of the fault memory of the KE-Jetronic control unit are output.

A summary of activation of the self-diagnosis is presented in the following flow diagram.



Arrow = Electric-fuel-pump relay bridged with fuse.

# SELF-DIAGNOSIS 04 (CONTINUED)

Test drive until coolant temperature greater than 65° °C (road/roller-type test stand) at engine speed greater than 3000 min<sup>-1</sup>. Briefly fully depress accelerator pedal. Finish test drive. Do not switch off ignition. Run engine at idle (less than 2000 min<sup>-1</sup>).

If engine does not run, then turn over for at least 6 seconds with starting motor. Do not switch off ignition.

Bridge contacts at electric-fuel-pump relay for at least 4 seconds with fuse. See illustration, arrow.

Flashing code 4 4 4 4 (no fault) recognized.

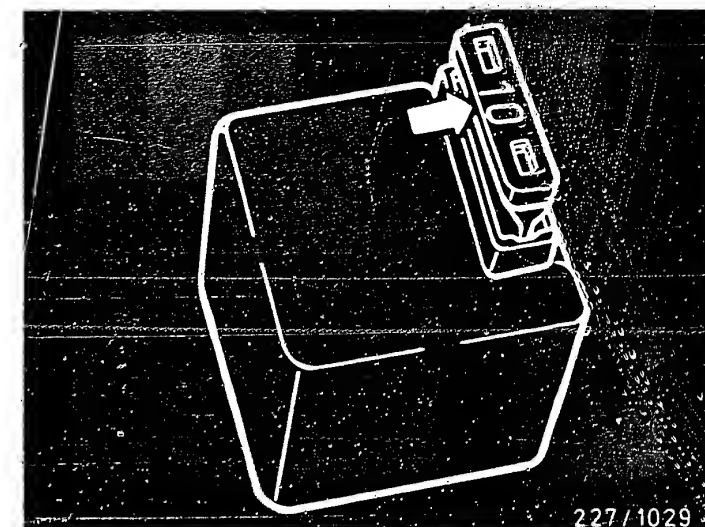
Bridge contacts at electric-fuel-pump relay with fuse for at least 4 seconds.

Flashing code 0 0 0 0 (End of fault output). Switch off ignition.

Indication of first fault flashing code. Note down flashing code.

Bridge contacts at electric-fuel-pump relay for at least 4 seconds with fuse. Note down flashing code. Repeat this procedure until flashing code 0 0 0 0 (end of fault output). Switch off ignition.

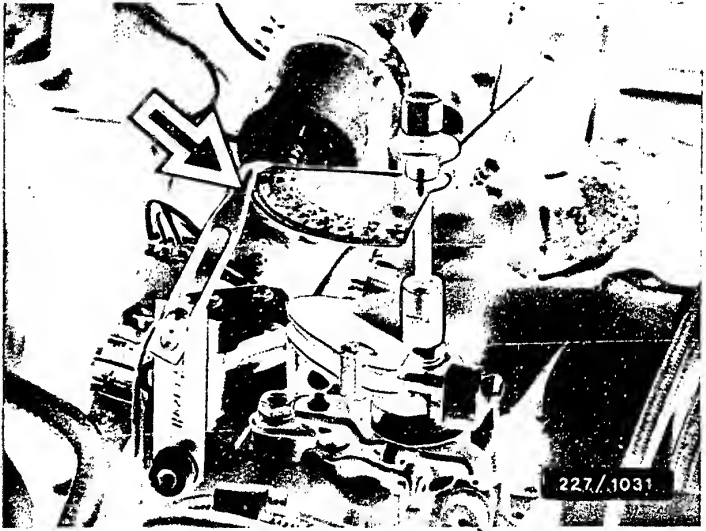
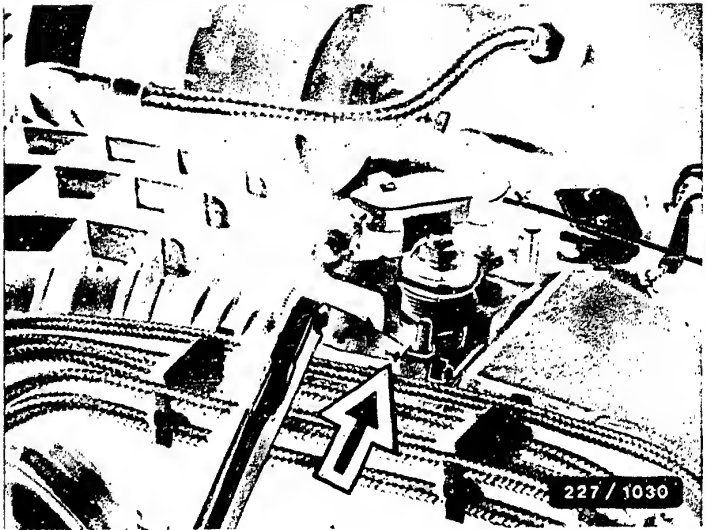
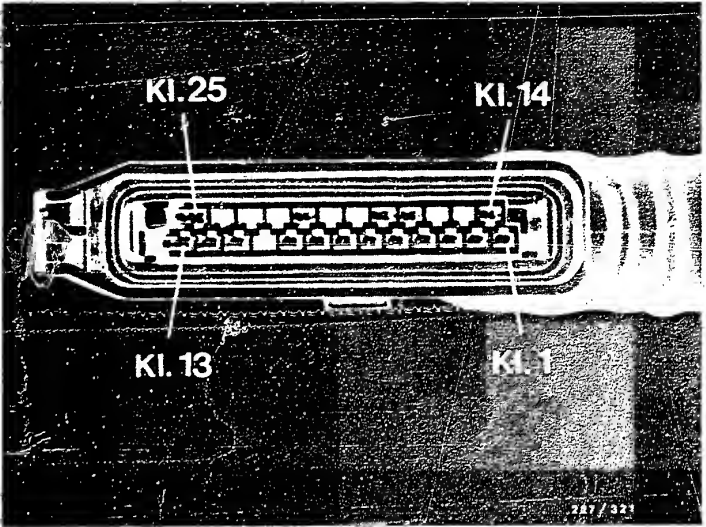
Remedy faults in accordance with self-diagnosis test table.



Arrow = Electric-fuel-pump relay bridged with fuse.

SELF-DIAGNOSIS TEST TABLE

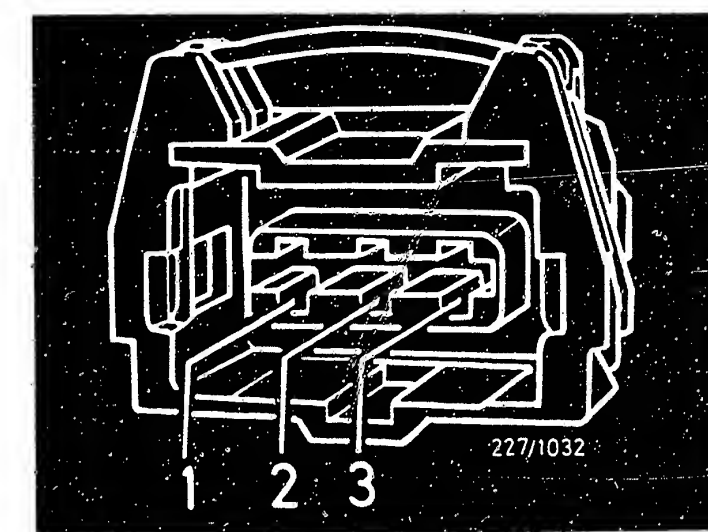
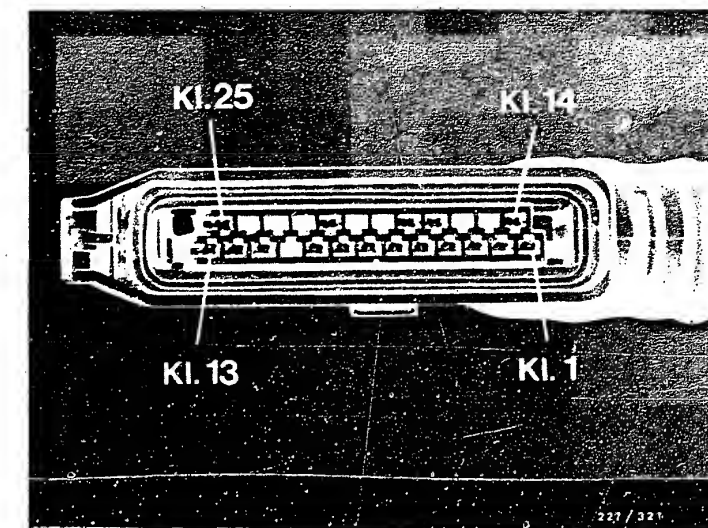
Fault indication Flashing code	Testing of component/ function Test instructions/conditions	Term- inals	Set values	Coor- din/ate
1 1 1 1	EI-K CONTROL UNIT  Replace EI-K control unit.	—	—	—
2 1 2 1	THROTTLE-VALVE SWITCH - IDLE  Voltage, EI-K control-unit plug. See upper illustration.  Throttle valve in idle position. Ignition ON.  Feeler gauge 0,5...0,7 mm between throttle-valve stop and adjusting screw. See center illustration, arrow.	7 20 (+) (-)	approx. battery voltage  0 V	B23
2 1 2 3	THROTTLE-VALVE SWITCH - FULL LOAD  Voltage, EI-K control-unit plug.  Ignition ON.  Graduated disk on throttle valve Stage 1. See lower illus., arrow. 68°...76° to idle position.	9 20 (+) (-)	0 V  approx. battery voltage	B27





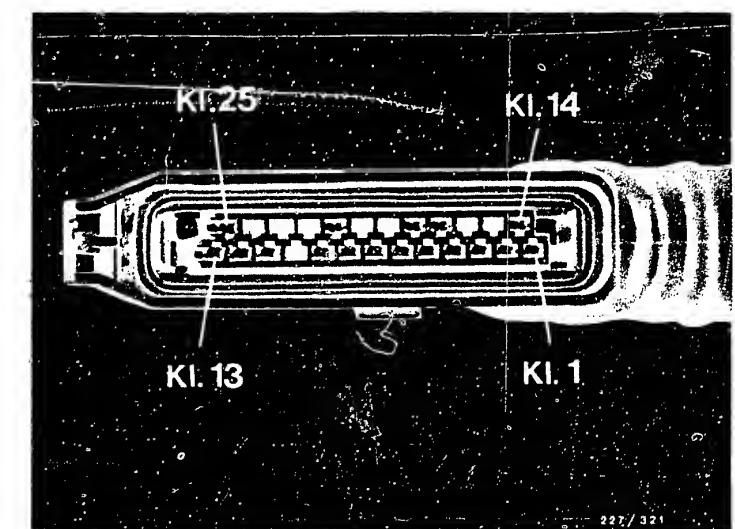
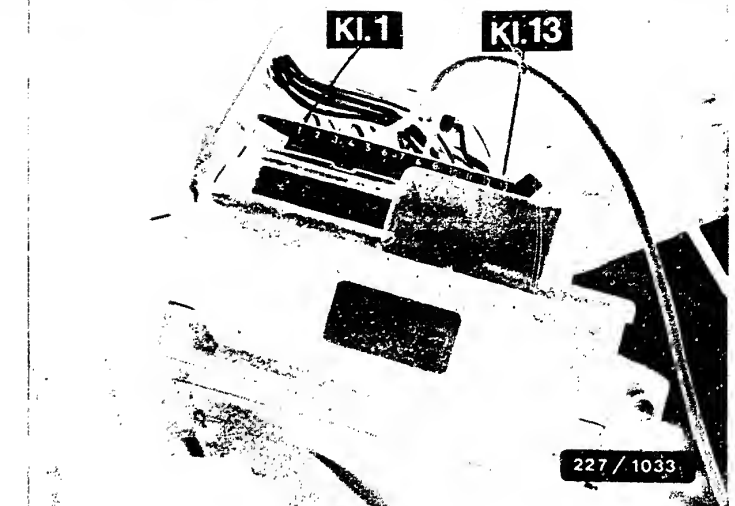
# SELF-DIAGNOSIS TEST TABLE (continued)

Fault indication Flashing code	Testing of component/ function Test instructions/conditions	Terminals	Set values	Coordinate
2 1 4 1	<p>MAXIMUM RETARDATION OF KNOCK CONTROL</p> <p>Octane rating of fuel too low; test ignition-point setting, fuel-injection system. Damage to bearing, abnormal engine noises.</p>	—	—	—
2 1 4 2	<p>KNOCK SENSOR</p> <p>Resistance, EI-K control-unit plug (upper illustration) and knock-sensor plug connection (center illustration).</p> <p>Resistance, knock-sensor plug connection. See center illus.</p> <p>Tightening torque. See lower illustration, arrow.</p>	<p>13 1 12 2 12 3</p> <p>1 2</p>	<p>approx. 0 <math>\Omega</math> approx. 0 <math>\Omega</math> approx. 0 <math>\Omega</math></p> <p>infinity <math>\Omega</math></p> <p>see brief instructions</p>	C03
2 2 2 3	<p>ALTITUDE SENSOR</p> <p>Voltage, EI-K control-unit plug. See upper illustration.</p> <p>Ignition ON.</p>	<p>2 20 (+) (-)</p>	<p>see brief instructions</p>	C07



## SELF-DIAGNOSIS TEST TABLE (continued)

Fault indication Flashing code	Testing of component/ function Test instructions/conditions	Terminals	Set values	Coordinate
2 2 3 2	LOAD SIGNAL  Voltage, EI-K control-unit plug with handle cover removed. See upper illustration.  Engine at idle.	8 20 (+) (-)	see brief instructions	C09
2 2 3 3	REFERENCE VOLTAGE FOR LOAD SIGNAL AND ALTITUDE-SENSOR SIGNAL  Voltage, EI-K control-unit plug. See lower illustration.  Ignition ON.	21 20 (+) (-)	see brief instructions	C11
2 3 1 2	TEMPERATURE SENSOR - COOLANT  Resistance, EI-K control-unit plug. See lower illustration.	25 20	see brief instructions	C13
4 4 4 4	NO FAULT STORED	—	—	—
0 0 0 0	END OF FAULT OUTPUT	—	—	—



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (01)

Flash code 2121

Test idle throttle-  
valve switch. N>

Switch off ignition.

Disconnect EI-K control-unit  
plug and connect voltmeter to  
term. 7 (+) and term. 20 (-).  
See upper illustration. Switch  
on ignition. Throttle valve  
is in idle position (idle switch  
is closed).

Set value:

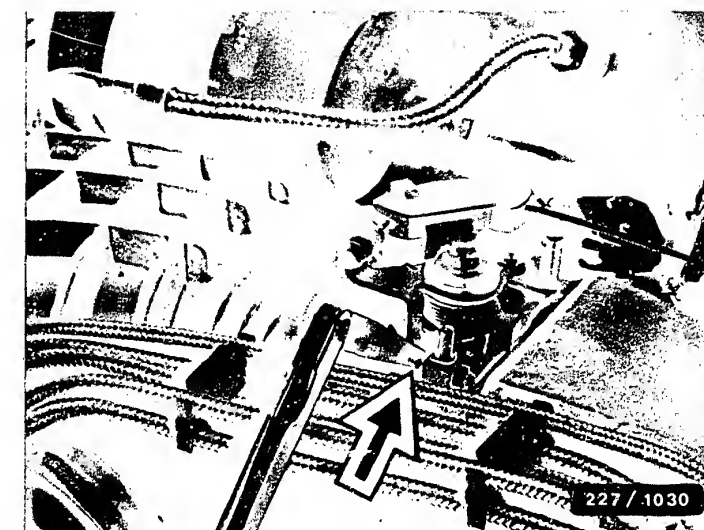
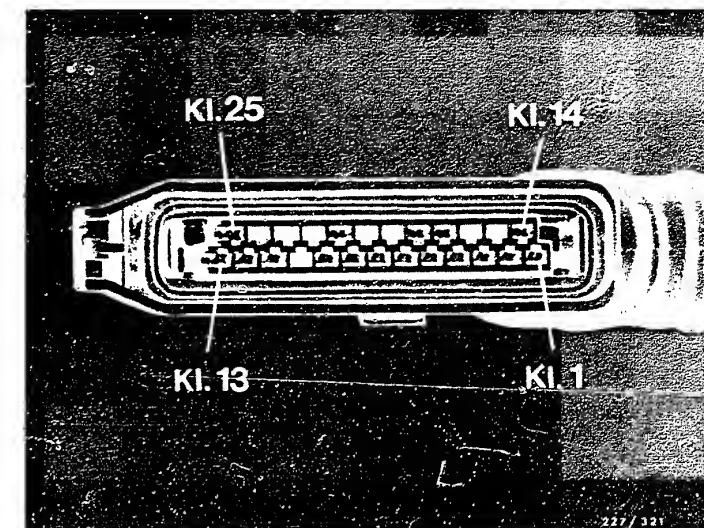
approx. battery voltage

Push feeler gauge 0,5...0,7 mm  
between throttle-valve stop and  
adjusting screw. See lower  
illustration, arrow. (Idle  
switch is open).

Set value: 0 V

Is set value obtained?

Switch off ignition.



Return to self-diagnosis  
test table B15

Continued on next picture page

Disconnect idle-switch plug.  
See upper illustration. Test  
cable connection of EI-K  
control-unit plug term. 7  
(center illustration) to idle-  
switch plug term. 1, and from  
idle-switch plug term. 2 via  
fuse No. 28 to ignition and  
starting switch term. 15 for  
open circuit.  
Eliminate open circuit.

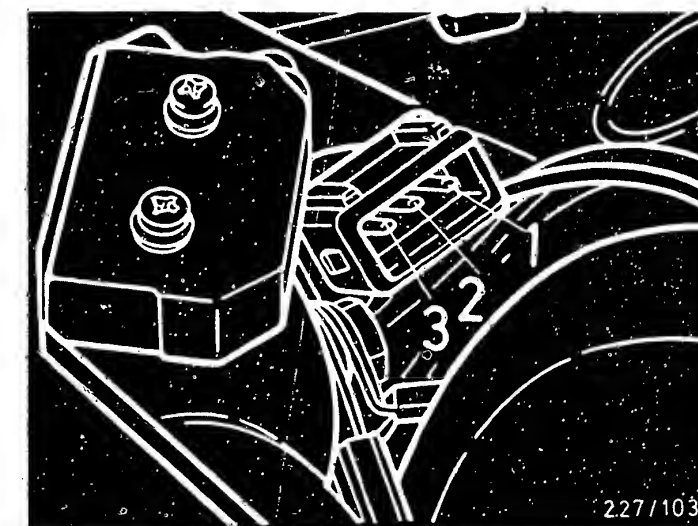
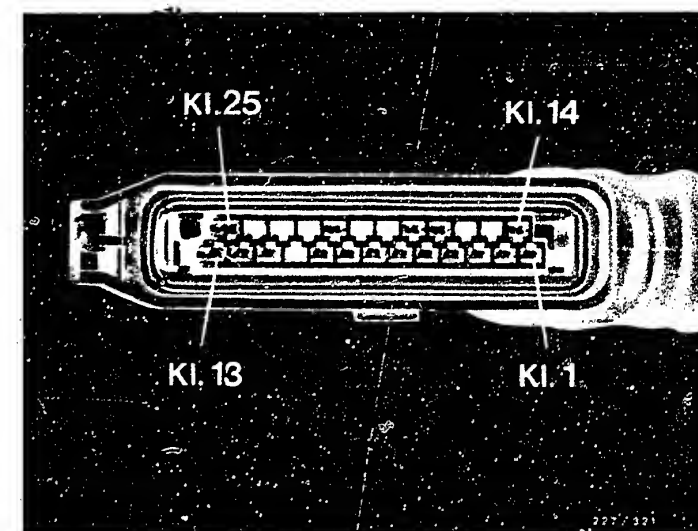
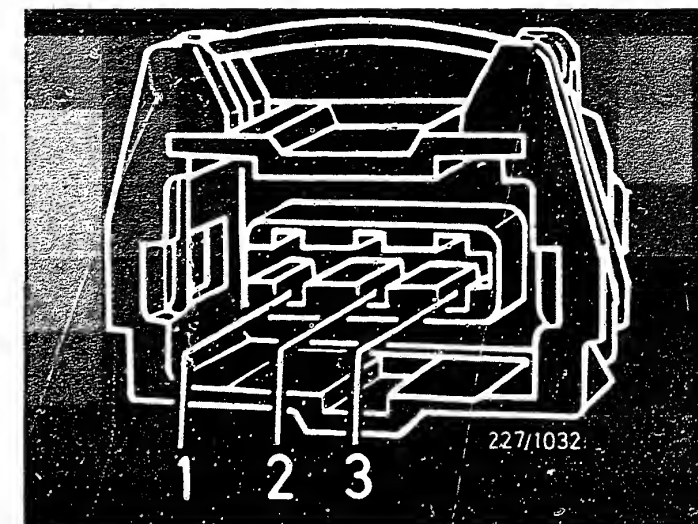
Adjust idle switch.

Connect ohmmeter to idle-switch  
plug connection term. 1 and  
term. 2.  
See lower illustration.  
Position idle switch over  
slotted holes so that the idle  
switch just opens when a  
0,6 mm feeler gauge is inserted.

Set value:  
Feeler gauge inserted,  
infinity  $\Omega$ .

Feeler gauge n o t inserted,  
approx. 0  $\Omega$ .  
Secure fastening screws with  
locking paint.  
If set values are not obtained,  
replace idle switch.

Return to self-diagnosis  
test table B17



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 2 )

Flash code 2123

Test full-load  
throttle-valve  
switch.

N>

Switch off ignition.  
Disconnect EI-K control-unit  
plug and connect voltmeter to  
term. 9 (+) and term. 20 (-).  
See upper illustration. Switch  
on ignition.

Throttle valve is in idle  
position (full-load switch is  
open).

Set value: 0 V

Screw graduated disk KDJE 7462  
onto throttle-valve shaft  
(Stage 1), and unscrew  
fastening nut for throttle-  
valve lever if necessary.  
See lower illustration.  
Adjust graduated disk to  
0°.

Slowly open throttle valve.

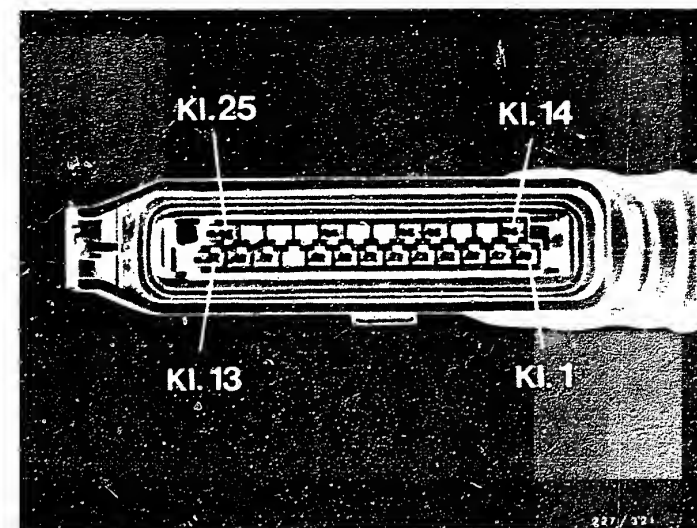
Set value: 68°...76°  
after idle position, approx.  
battery voltage.

Is set value obtained?

Switch off ignition.

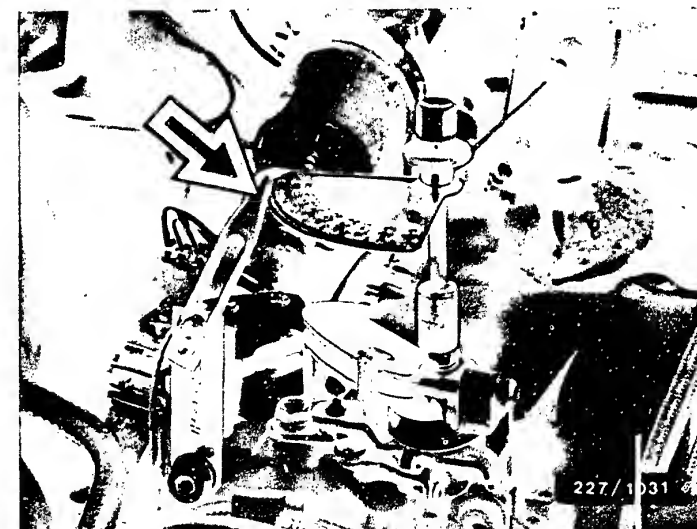
Return to self-diagnosis  
test table B17

Continued on next picture page



EI-K control-unit plug

Arrow = Graduated disk KDJE 7462





↓

Disconnect full-load-switch plug. See upper illustration. Test cable connection from EI-K control-unit plug term. 9 (center illustration) to full-load-switch plug term. 3, and from full-load switch plug term. 2 via fuse No. 28 to ignition and starting switch term. 15 for open circuit. Eliminate open circuit.

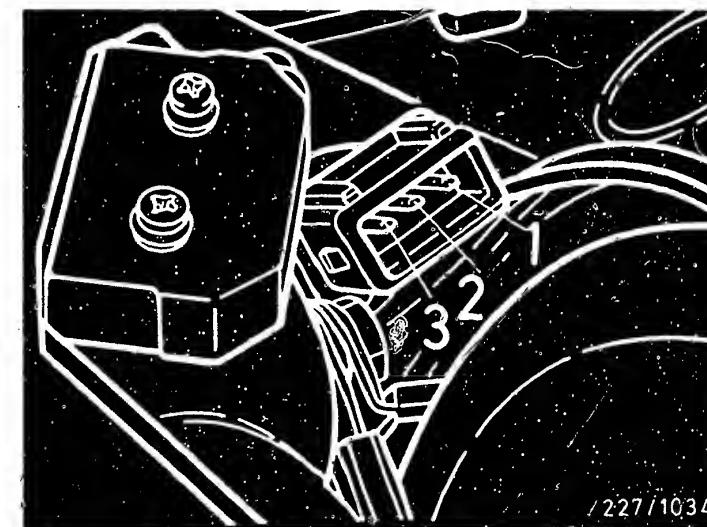
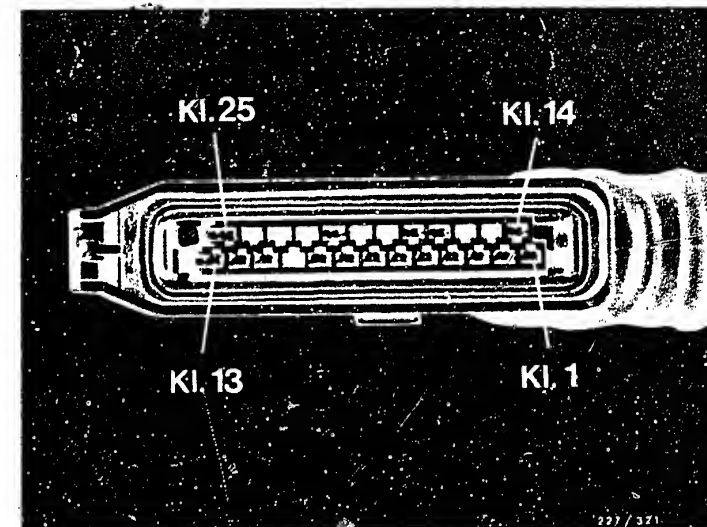
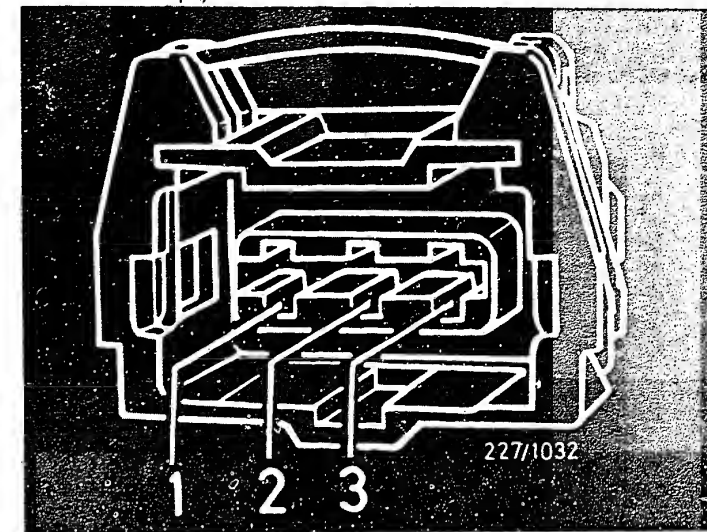
Adjust full-load switch.

Connect ohmmeter to full-load-switch plug connection term. 3 and term. 2. See lower illustration. Slowly open throttle valve.

Set value:  $68^{\circ} \dots 76^{\circ}$  after idle position, ohmmeter must indicate approx.  $0 \Omega$  (continuity). Adjust full-load switch over slotted holes. Check: set value in throttle-valve idle position, infinity  $\Omega$ . Secure fastening screws with locking paint. If set values are not obtained, replace full-load switch.

↓

Return to self-diagnosis test table B17



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 3 )

Flashing code 2142  
Test knock sensor.

N>

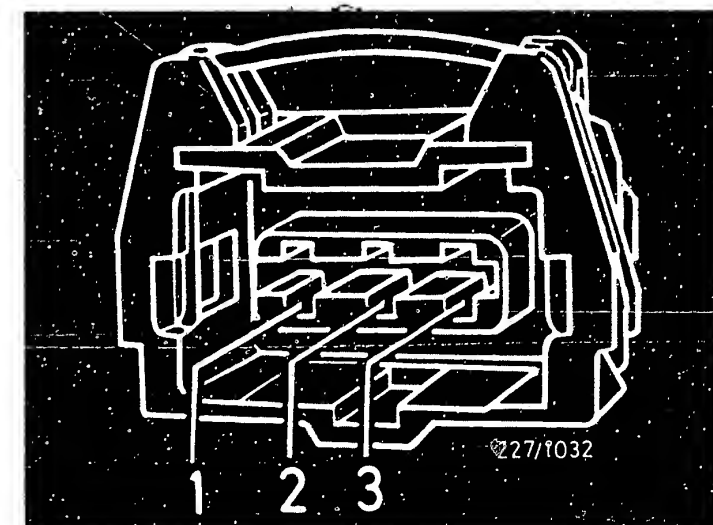
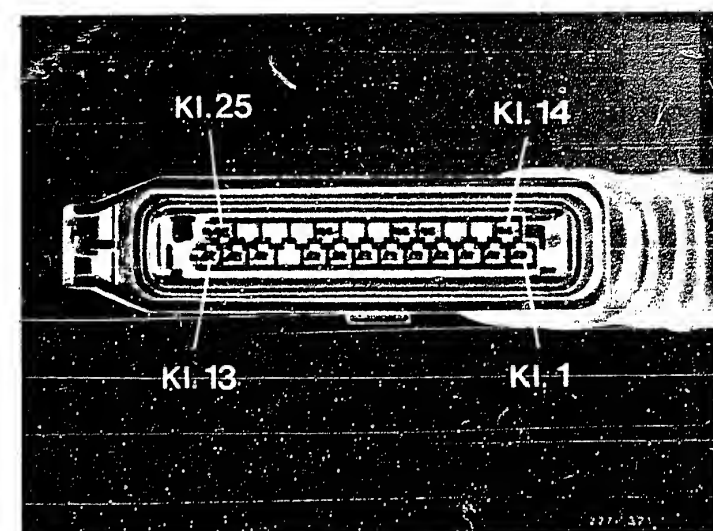
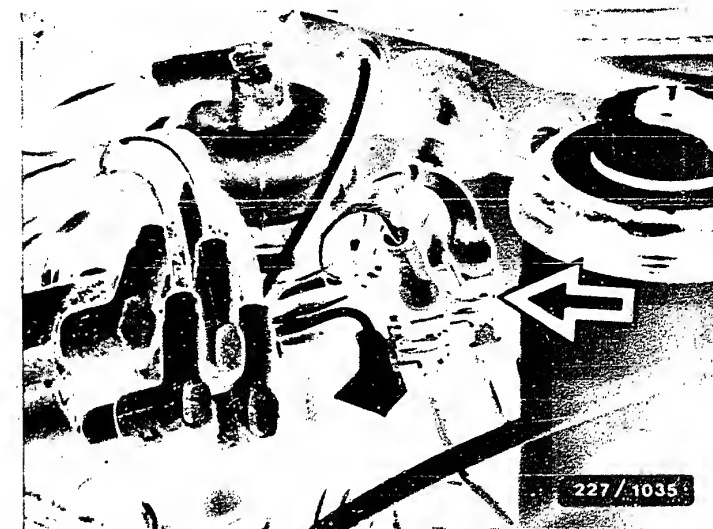
Eliminate open circuit.

Switch off ignition.  
Pull apart knock-sensor plug connection. See upper illustration, arrow.  
Disconnect EI-K control-unit plug. See center illustration.  
Connect ohmmeter to:

EI-K control-unit plug (center illustration)	Knock-sensor plug connection (lower illustration)
Term. 13 and term. 1	
Term. 12 and term. 2	
Term. 12 and term. 3	

Set value: approx. 0  $\Omega$   
(continuity)

Is set value obtained?



Continued on next picture page



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 3 ) CONTINUED ( 1 )

Connect ohmmeter to knock-sensor  
plug connection term. 1 and  
term. 2.  
See upper illustration.  
Set value: infinity  $\Omega$   
(open circuit).

N>

If ohmmeter indicates approx.  
0  $\Omega$  (continuity), eliminate  
short circuit to ground in  
EI-K control-unit plug to  
knock-sensor plug connection.

Is set value obtained?

Check tightening torque of  
knock-sensor fastening screw.  
See lower illustration, arrow.  
Set value: see brief instructions

N>

Tighten to specified tightening  
torque.

Is set value obtained?

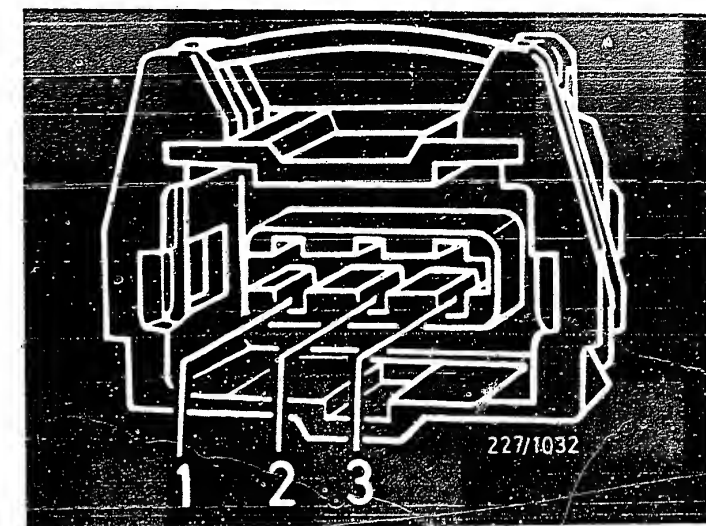
Replace knock sensor.  
Activate self-diagnosis.  
"Old" knock sensor is defective,  
if fault lamp now no longer  
indicates flash code 2142.

N>

Re-install "old" knock sensor  
and replace EI-K control  
unit.

Self-diagnosis O.K.?

Return to self-diagnosis  
test table B17



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 4 )

Flash code 2223.  
Test altitude  
sensor.

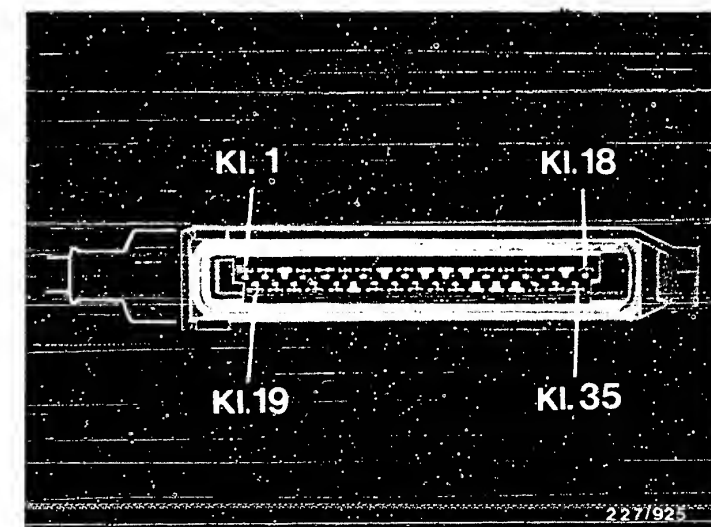
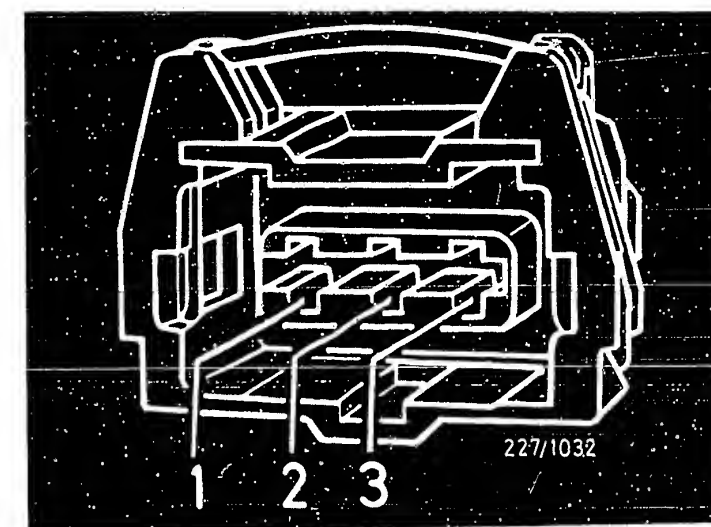
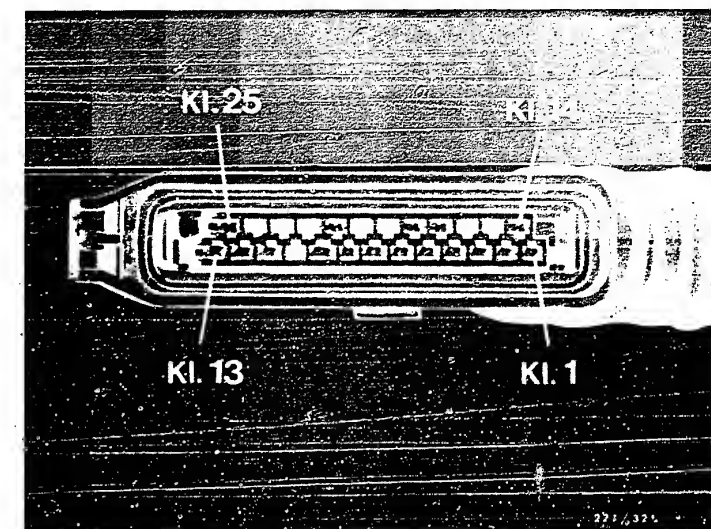
Switch on ignition.  
KE-Jetronic control-unit plug  
is connected.  
Disconnect EI-K control-unit  
plug and connect voltmeter to  
term. 2 (+) and term. 20 (-).  
See upper illustration.  
Switch on ignition.  
Altitude-dependent set values:  
See brief instructions.  
Is set value obtained?

N>

1. Switch off ignition.  
Disconnect altitude-sensor plug  
and connect voltmeter to term. 2  
(+) and term. 3 (-).  
See center illustration.  
Switch on ignition.  
Set value: 4.35...5.35 V

If set value was not obtained,  
test lead from altitude-sensor  
plug term. 2 to KE-Jetronic  
control-unit plug term. 26,  
and lead from altitude-sensor  
plug term. 3 to intake-manifold  
ground for open circuit and  
short circuit.  
Eliminate open circuit/short  
circuit.  
If no open circuit/short  
circuit was present, replace  
KE-Jetronic control unit.

2. Test lead from EI-K control-  
unit plug term. 2 to altitude-  
sensor plug term. 1 for open  
circuit and short circuit.  
Eliminate open circuit/short  
circuit.  
If no open circuit/short circuit  
was present, replace altitude  
sensor.



Return to self-diagnosis  
test table B17

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 5 )

Flash code 2232

Test load signal.

Switch off ignition.  
Disconnect EI-K control-unit  
plug and push back handle cover  
(upper illustration) after  
unscrewing the fastening screw  
and removing the sealing  
rubber.  
Connect EI-K control-unit  
plug.  
Connect voltmeter to term. 8 (+)  
and term. 20 (-).  
See upper illustration.  
Run engine at idle.

Set value: see brief instruc.

Is set value obtained?

N>

1. Switch off ignition.  
Disconnect EI-K and KE-Jetronic  
control-unit plugs. Test  
lead from EI-K control-unit  
plug term. 8 to KE-Jetronic  
control-unit plug term. 21  
(center illustration) for open  
circuit.  
Eliminate open circuit.  
Connect ohmmeter to KE-Jetronic  
control-unit plug term. 26  
and term. 35.

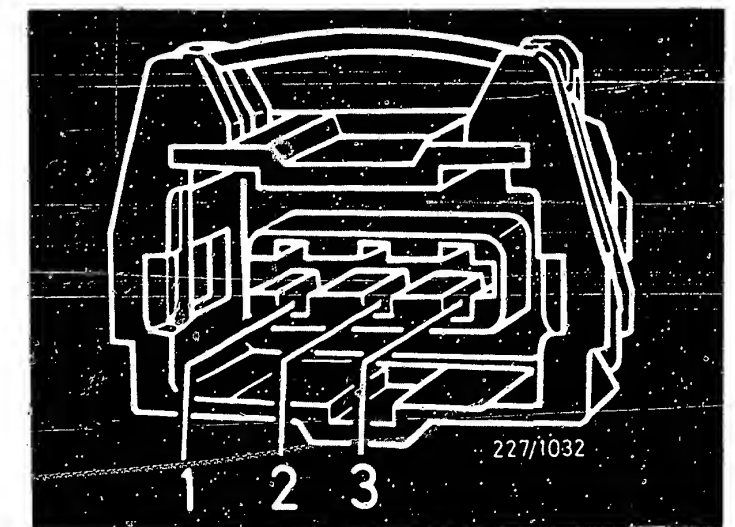
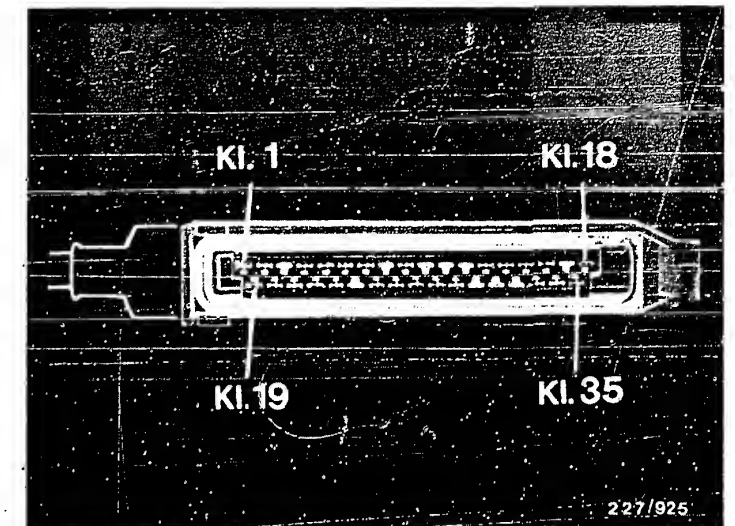
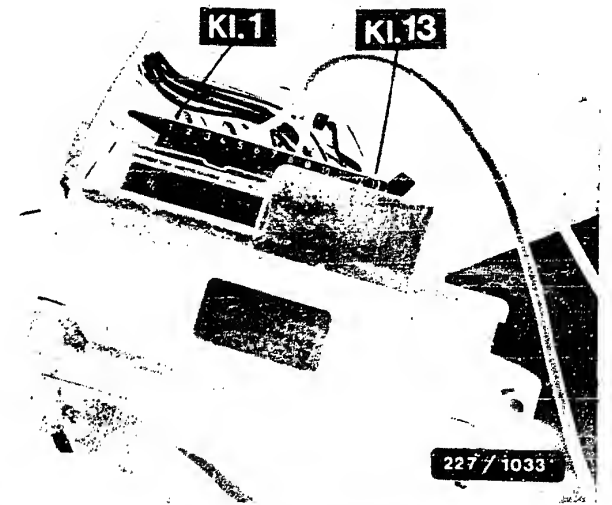
Set value: 3,0...5,0 k  $\Omega$

Connect ohmmeter to KE-Jetronic  
control-unit plug term. 23  
and term. 35.

Set value: 500...950  $\Omega$   
If set values O.K., replace  
KE-Jetronic control unit.

2. If set values not O.K.,  
test leads from KE-Jetronic  
control-unit plug term. 26,  
term. 23 and term. 35 to air-  
flow-sensor plug (lower illust-  
ration) term. 1, term. 2  
and term. 3 for open circuit.  
Eliminate open circuit.  
If no open circuit was present,  
replace air-flow sensor.

Return to self-diagnosis  
test table B17



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 6 )

FLASH CODE 2 2 3 3

Test reference voltage of load signal and altitude-sensor signal.

Switch off ignition.

Disconnect EI-K control-unit plug and connect voltmeter to term. 21 (+) and term. 20 (-). See upper illustration.

Switch on ignition.

Set value: see brief instruc.

Is set value obtained?

N>

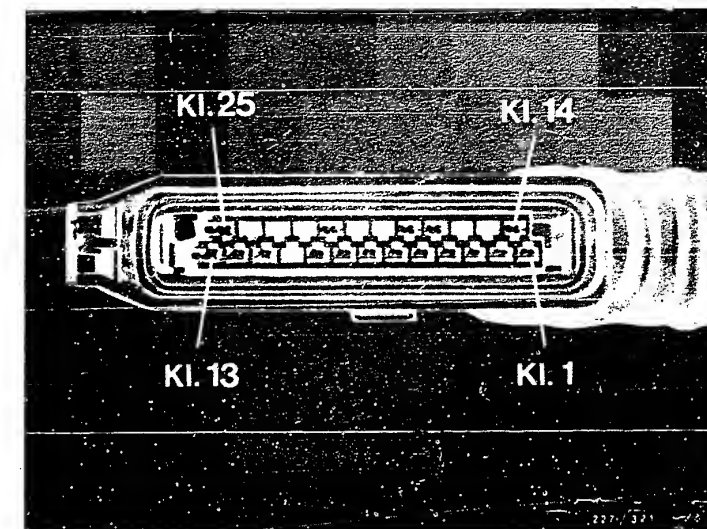
Switch off ignition.

Disconnect KE-Jetronic control-unit plug. See lower illustration.

Test lead from KE-Jetronic control-unit plug term. 26 to EI-K control-unit plug term. 21 for open circuit.

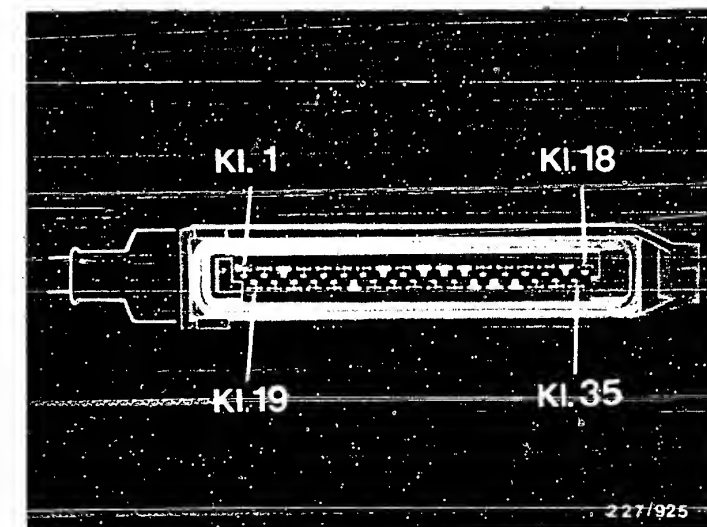
Eliminate open circuit.

If no open circuit was present, replace KE-Jetronic control-unit.



EI-K control-unit plug

KE-Jetronic control-unit plug



Return to self-diagnosis test table B17

C11

<=>

C12

<=>

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 7 )

FLASH CODE 2 3 1 2

Test coolant-temperature sensor.

Switch off ignition.

Disconnect EI-K control-unit  
plug and connect ohmmeter to  
term. 25 and term. 20.  
See upper illustration.

Set values; see brief  
instructions

Is set value obtained?

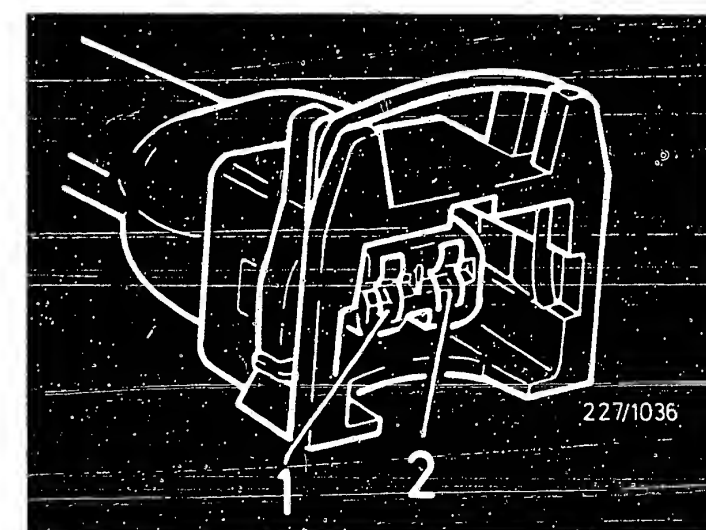
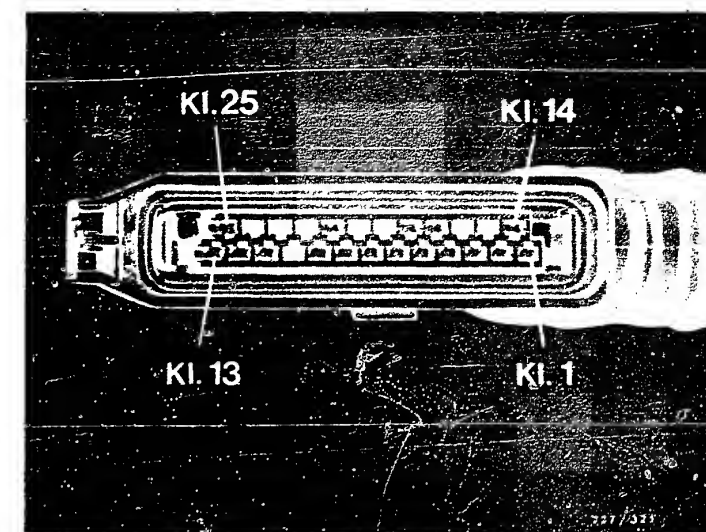
N>

Disconnect temperature-sensor  
plug. See lower illustration.

Test lead from EI-K control-  
unit plug term. 25 to temper-  
ature-sensor plug term. 1  
for open circuit.

Eliminate open circuit.

If no open circuit was present,  
replace coolant-temperature  
sensor.



Return to self-diagnosis  
test table B17

TRUBLE-SHOOTING PROGRAM ( 1 )

V

Test high-voltage side.

N>

Repair high-voltage side.

Test spark plugs, spark-plug connectors, suppression resistors, H.T. ignition cables, distributor cap, distributor rotor etc. for proper operation (e.g. open circuit, shunt).

Assessment e.g. through ignition oscillogram, resistance measurements and visual check.

High-voltage side O.K.?

Y

Return to trouble-shooting chart B07

C15

==>

C16

<==>



# TROUBLE-SHOOTING PROGRAM ( 2 )

## Test ignition coil

Visual examination: (BOSCH only)

Remove protective cap from ignition coil and test whether plug is present and if sealing compound has escaped. See illustration.

Electrical test:

Ignition coil primary term. 15 and term. 1.  
(Take resistance of test lead and test prods into account.)

Set value: see brief instruc.

Ignition coil secondary term. 1 and term. 4.

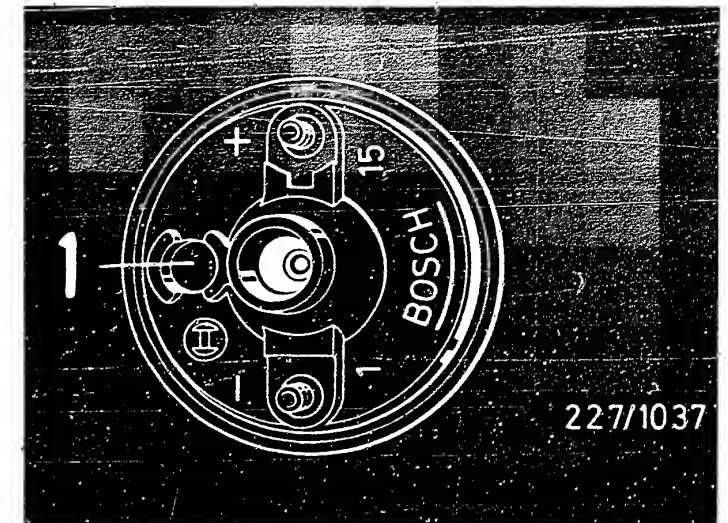
Set value: see brief instruc.

Visual examination O.K., and is set value obtained?

N>

1. If plug is not present or sealing compound has escaped, replace EI-K control unit, and trigger box and ignition coil.

2. If set values are not O.K., replace ignition coil.

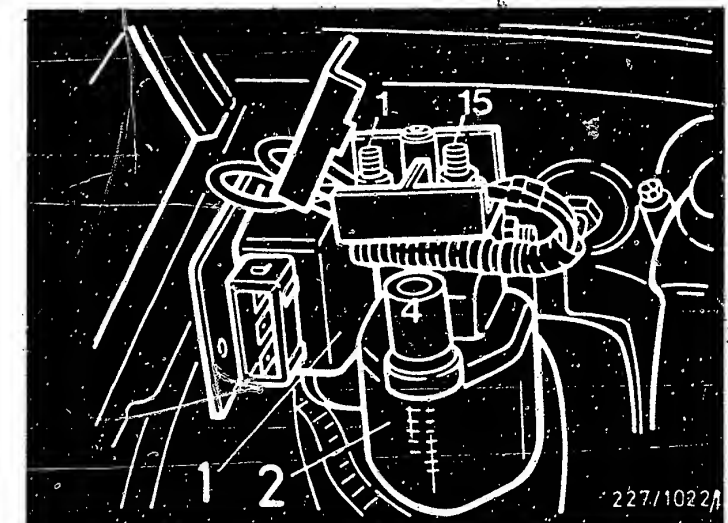


1 = Plug

1 = Trigger box

2 = Ignition coil  
(non-Bosch product)

1, 4, 15 =  
Terminal assignment, ignition coil



Return to trouble-shooting chart  
B07



# TROUBLE-SHOOTING PROGRAM ( 3 )

Test voltage supply of  
EZ-K control unit.

Switch off ignition.

Disconnect EI-K control-unit  
plug and connect voltmeter  
to term. 6 (+) and term. 20 (-).  
See illustration.

Switch on ignition.

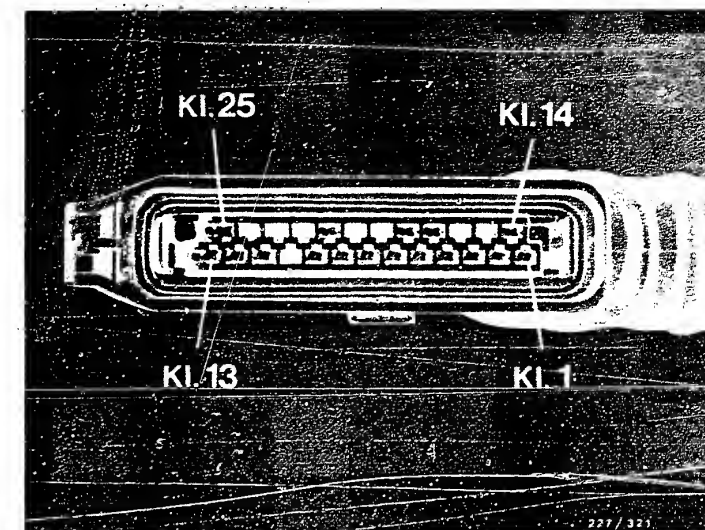
Set value: battery voltage

Is set value obtained?

N>

Test lead from ignition and  
starting switch term. 15 to  
EI-K control-unit plug term. 6,  
including ground cable term. 20  
to intake-manifold ground for  
open circuit.

Eliminate open circuit.



EI-K control-unit plug

Return to trouble-shooting chart  
B07

# TROUBLE-SHOOTING PROGRAM ( 4 )

Test ignition-distributor plug and ignition-distributor socket.

N>

Eliminate oxidation.

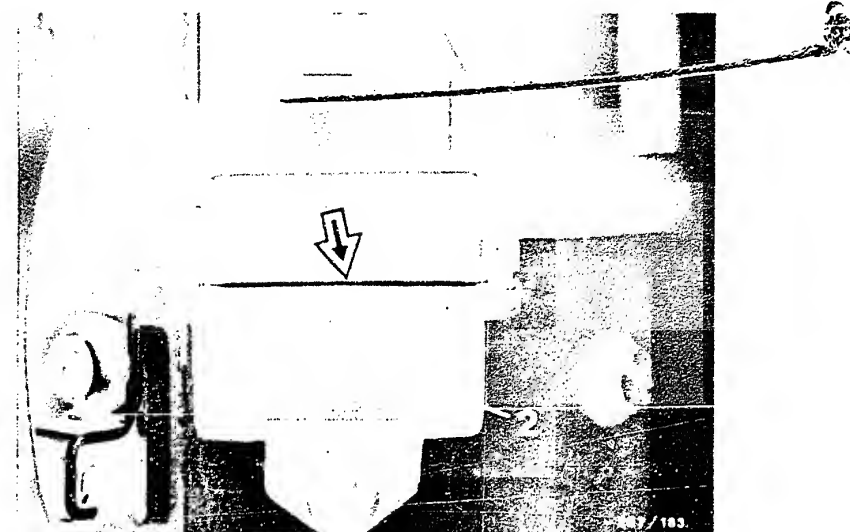
Press wire clip of ignition-distributor plug.  
See upper illustration, arrow.

Remove ignition-distributor plug.

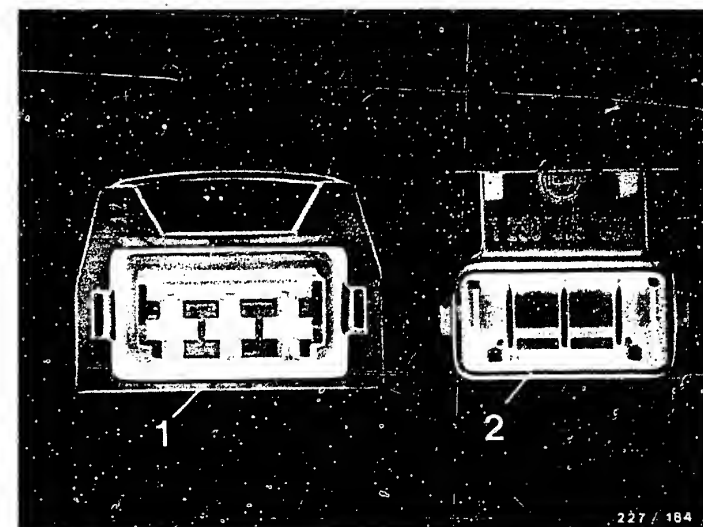
Visual examination:  
Test contacts of ignition-distributor plug and ignition-distributor socket for oxidation.

Contacts O.K.?

Return to trouble-shooting chart B07



1 = Ignition-distributor plug  
2 = Ignition-distributor socket



# TROUBLE-SHOOTING PROGRAM ( 5)

Test voltage supply of magnetic pulse generator.

Ignition-distributor and EI-K control-unit plugs are connected.

Push back rubber sleeve of ignition-distributor plug.

Connect voltmeter to ignition-distributor plug term. 4 (+) and term. 10 (-).

Switch on ignition.

Set value equal to/greater than 10 V

Is set value obtained?

N>

1. If greater than 0 V was indicated, switch off ignition.

Remove ignition-distributor plug and connect voltmeter to term. 4 (+) and term. 10 (-).  
Switch on ignition.

If set value of equal to/greater than 10 V not obtained, replace EI-K control unit.

If set value of equal to/greater than 10 V obtained, replace magnetic pulse generator.

2. If 0 V was indicated, switch off ignition.

Disconnect ignition-distributor and EI-K control-unit plugs.  
Connect ohmmeter in turn to:

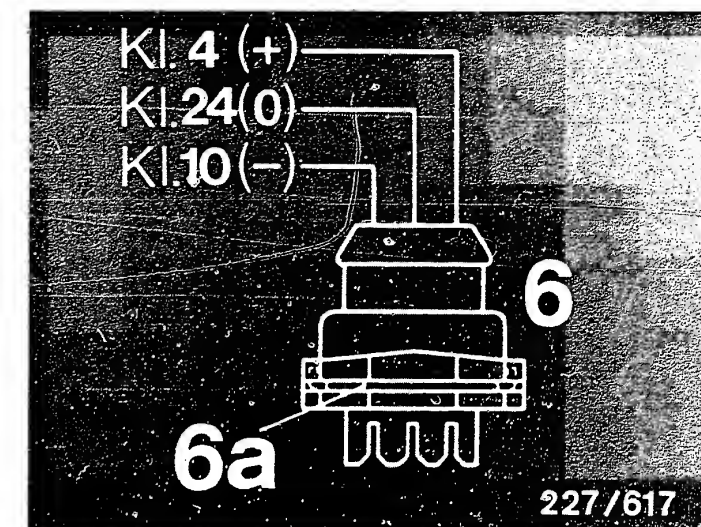
Ig.-distri- butor plug	EI-K control- unit plug
Term. 4	and Term. 4
Term. 10	and Term. 10

Term. 4 and Term. 4  
Term. 10 and Term. 10

Set value in each case:  
approx. 0  $\Omega$  (continuity).

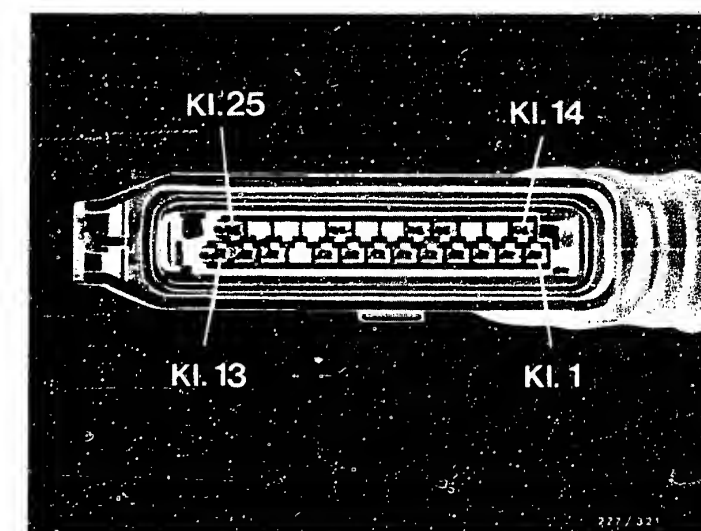
Eliminate open circuit.

If no open circuit was present, replace EI-K control unit.



6 =Ignition-distributor plug  
6a=Wire-loop clip

EI-K control-unit plug



Return to trouble-shooting chart B07

# TRUBLE-SHOOTING PROGRAM ( 6 )

Test operation of magnetic pulse generator.

Ignition-distributor and EI-K-control-unit plugs are connected.

Push back rubber sleeve of ignition-distributor plug.

Connect oscilloscope in program-switch position "Special" in accordance with operating instructions.

For example, MOT 201:

Red terminal with test prod to ignition-distributor plug term. 24 (measuring signal).

Black terminal to vehicle ground.

Start engine.

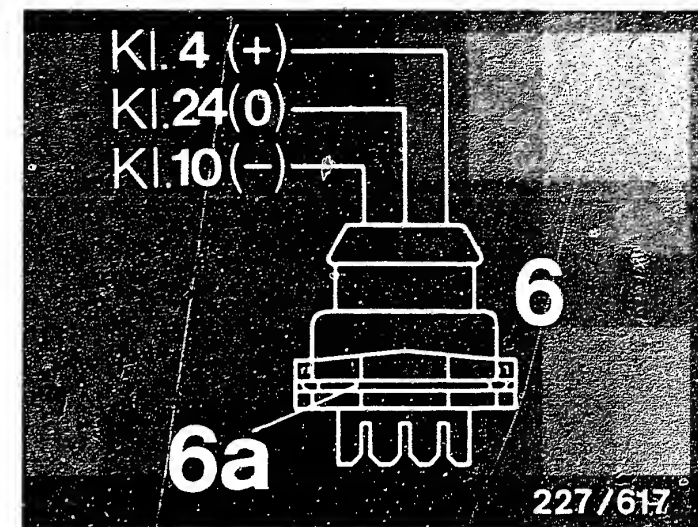
Oscilloscope must indicate rectangular pulse. See illus.

Rectangular pulse present?

N>

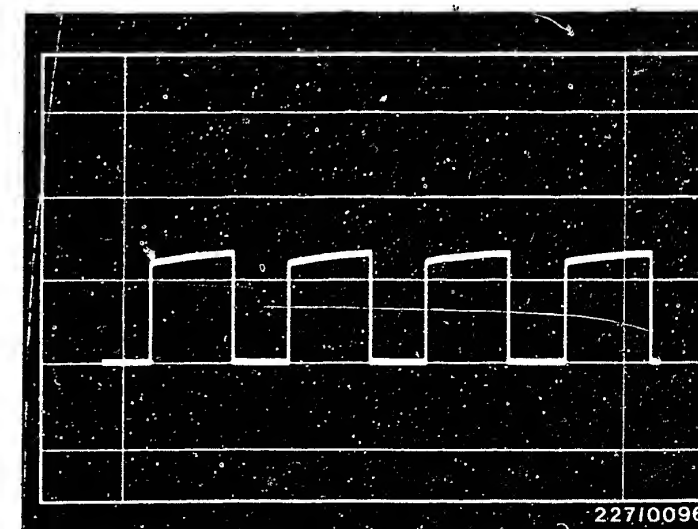
Replace magnetic pulse generator and/or ignition distributor.

Return to trouble-shooting chart B07



6 =Ignition-distributor plug  
6a=Wire-loop clip

Rectangular pulse



# TROUBLE-SHOOTING PROGRAM ( 7 )

Test operation of EI-K control unit.

Trigger-box, ignition-distributor and EI-K-control-unit plugs are connected.

Push back rubber sleeve of trigger-box plug.

Connect oscilloscope in program-switch position "Special" in accordance with operating instructions..

For example, MOT 201:

Red terminal with test prod to trigger-box plug term. 2 (measuring signal).

Black plug to vehicle ground.

Start engine.

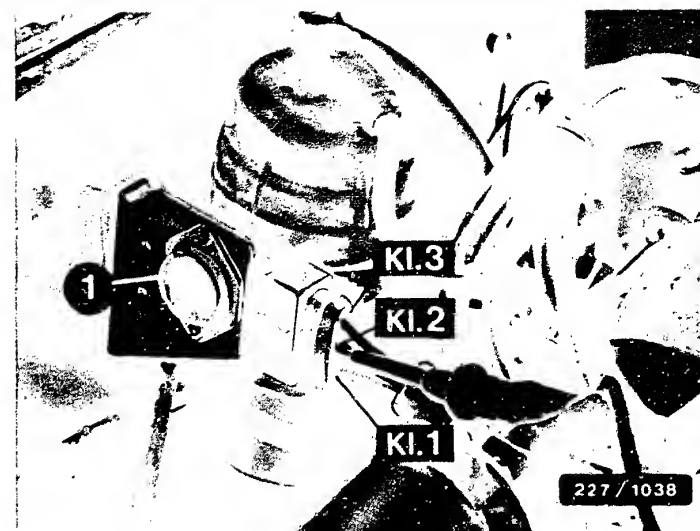
Oscilloscope must indicate a rectangular pulse.  
See lower illustration.

Rectangular pulse present?

N>

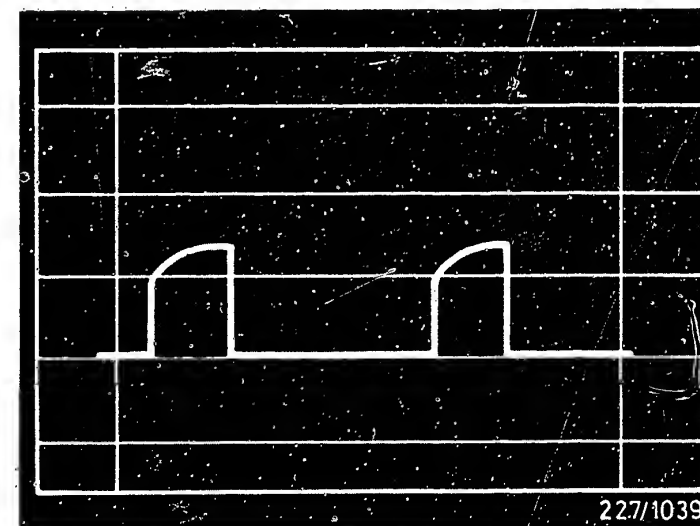
Switch off ignition.

Disconnect trigger-box, ignition-distributor and EI-K-control-unit plugs.



1 = Trigger box

Rectangular pulse



Return to trouble-shooting chart B07

Continued on next picture page

Connect ohmmeter in turn to:

Ignition-dis- tributor plug (upper ill.)	EI-K-control- unit plug (center ill.)
Term. 24	and Term. 24

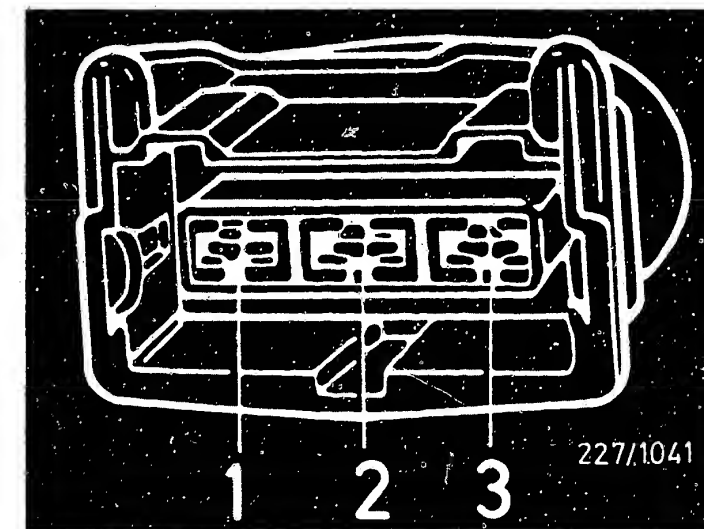
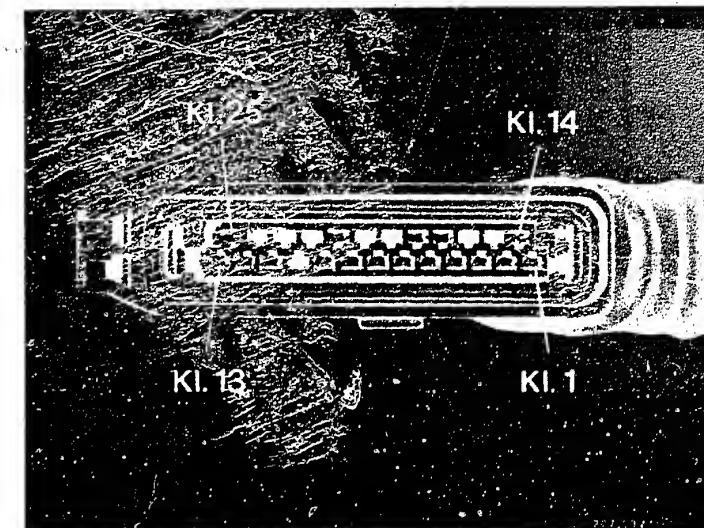
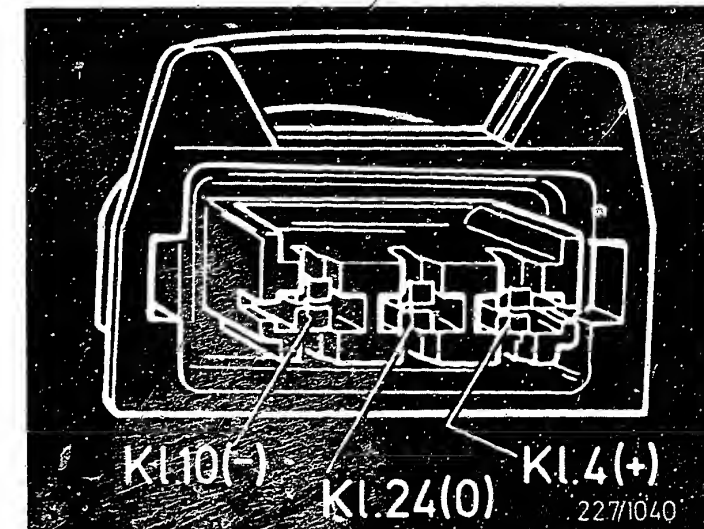
EI-K-control- unit plug	Trigger- box plug (lower ill.)
Term. 16	and Term. 2

Set value: approx.  $0 \Omega$   
in each case (continuity)

Eliminate open circuit.

If no open circuit was present,  
replace EI-K control unit.

Return to trouble-shooting chart  
B07





TROUBLE-SHOOTING PROGRAM ( 8 )

V

Test voltage supply of  
trigger box.

Switch off ignition.

Disconnect trigger-box plug  
and connect voltmeter to term. 1  
(+) and term. 3 (-).  
See illustration.

Switch on ignition.

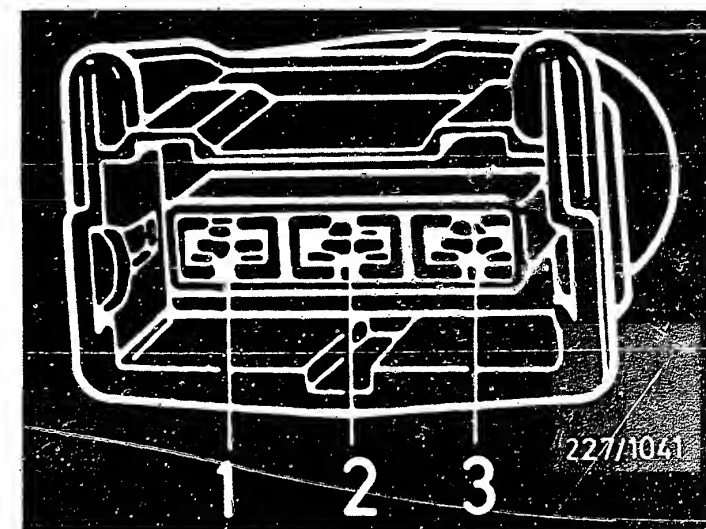
Set value: battery voltage.

Is set value obtained?

N>

Test leads and connections of  
ignition and starting switch  
to trigger-box plug term. 1,  
including ground cable  
term. 3 for open circuit.

Eliminate open circuit.



Trigger-box plug

Y

Return to trouble-shooting chart  
B07

D03

<=>

D04

<=>

# TROUBLE-SHOOTING PROGRAM ( 9 )

V

## Test primary signal

EI-K control-unit plug, trigger-box plug and ignition-distributor plug are connected.

Remove protective cap of ignition coil.

## Primary signal with oscilloscope

Connect oscilloscope to ignition coil in accordance with operating instructions.

Start engine. Oscilloscope must indicate a primary voltage (level irrelevant).

O R

primary signal with engine-speed tester.

Connect engine-speed tester to ignition coil in accordance with operating instructions.

Start engine.

Engine-speed tester must indicate a value (level irrelevant).

Primary signal present?

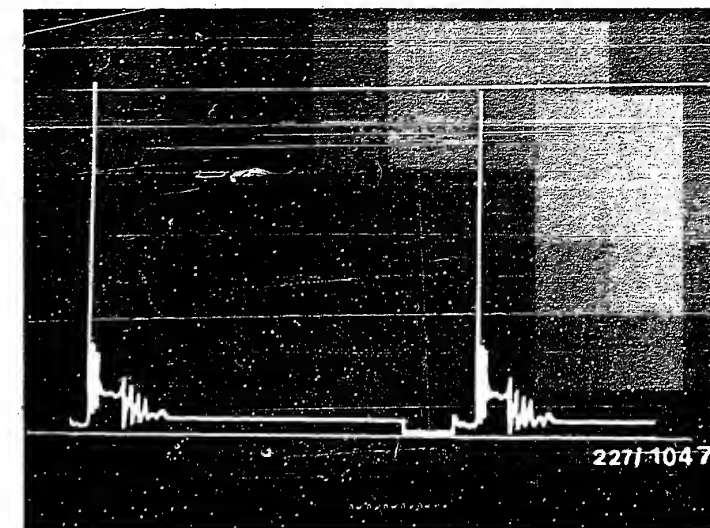
Y

V

Return to trouble-shooting chart B07

N>

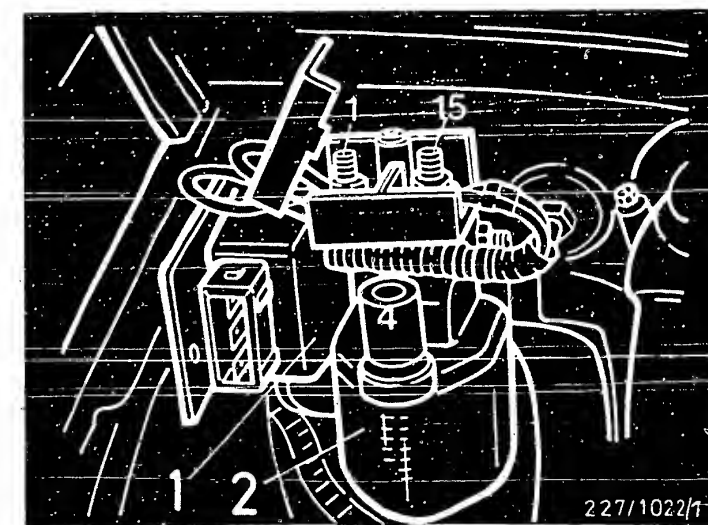
Replace ignition coil with trigger box.



Primary signal

1 = Trigger box  
2 = Ignition coil  
(non-Bosch product)

1, 4, 15 =  
Terminal assignment, ignition coil



# TROUBLE-SHOOTING PROGRAM (10)

Test activation of electric-fuel-pump relay.

N>

EI-K control-unit plug is connected.

Switch on ignition.

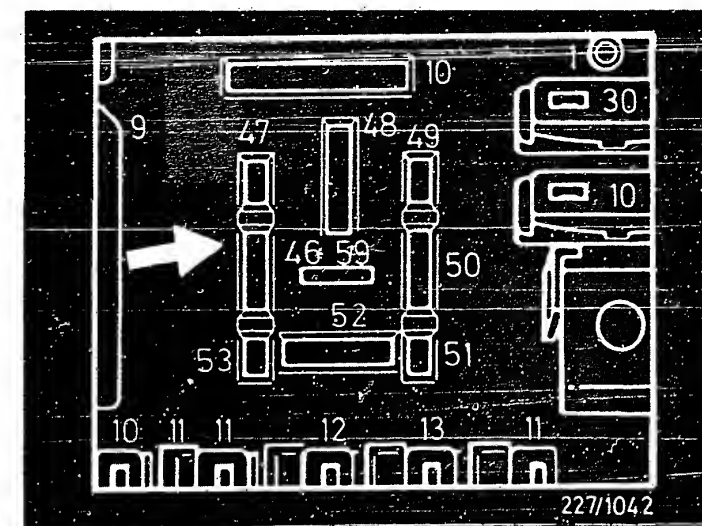
Electric-fuel-pump relay including electric fuel pump are activated for approx. 1 second.

Activation (acoustic) O.K.?

1. Pull electric-fuel-pump relay out of relay position 10. See upper illustration, arrow.  
Connect voltmeter to relay plate term. 48 (+) and term. 50 (-).  
Set value: approx. 12 V  
If set value is not obtained, eliminate open circuit between relay plate term. 48 and positive battery terminal.
2. Connect voltmeter to relay plate term. 46 (+) and term. 50 (-).  
Switch on ignition.  
Set value: approx. 12 V  
If set value is not obtained, eliminate open circuit between relay plate term. 46 and ignition and starting switch term. 15.
3. Connect voltmeter to relay plate term. 46 (+) and term. 47 (-).  
Briefly actuate starting motor.  
Set value: at least 7.0 V.  
If set value is not obtained, eliminate open circuit between relay plate term. 47 and EI-K control-unit plug term. 14 (lower illustration).

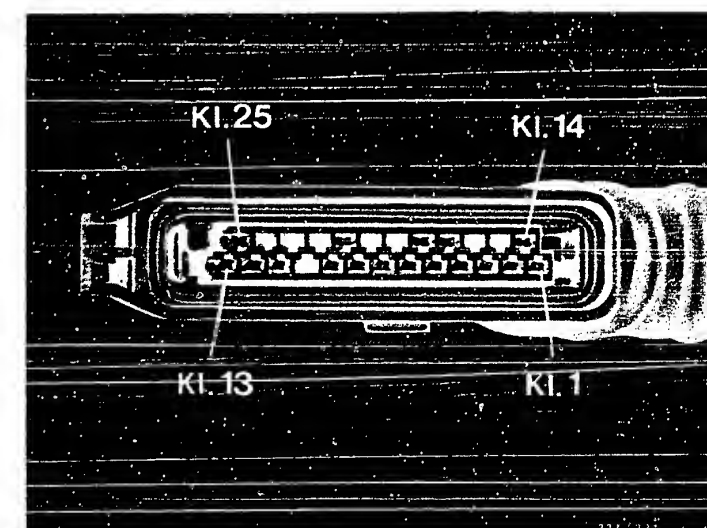
If no open circuit was present under points 1 to 3, replace EI-K control unit.

Return to trouble-shooting chart B07



Relay plate

EI-K control-unit plug



# TROUBLE-SHOOTING PROGRAM (11)

Test contact resistance  
(primary side).

N>

Eliminate contact resistance.

Disconnect negative and  
positive cables from battery.  
Disconnect trigger-box plug.  
See upper illustration, arrow.

Switch on ignition.

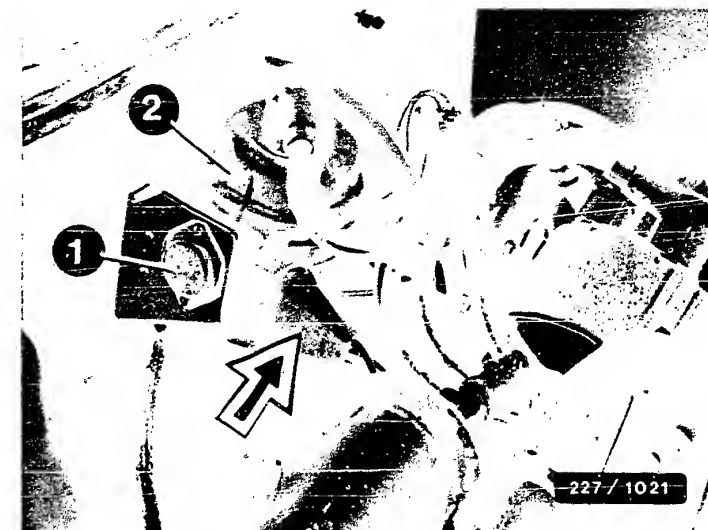
Test leads from positive battery  
terminal to trigger-box plug  
term. 1, and from negative  
battery terminal to trigger-box  
plug term. 3 for contact resis-  
tance. See lower illustration.

(Take resistance of test lead  
and test prods into account).

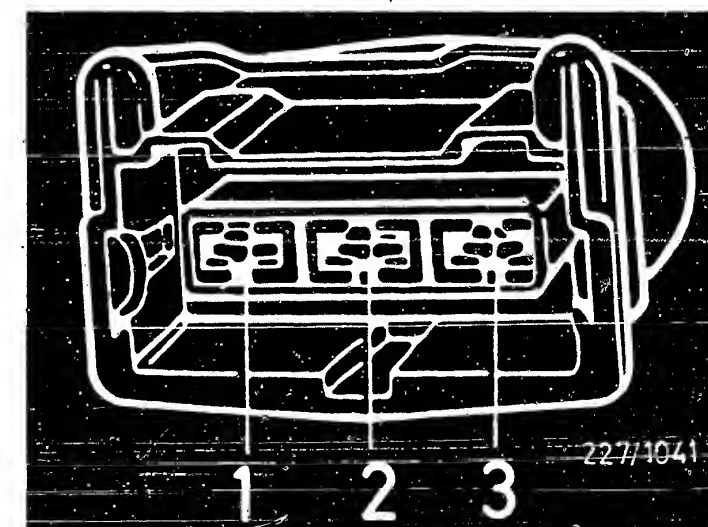
Set value: see brief  
instructions

Is set value obtained?

Return to trouble-shooting chart  
B07



1 = Trigger box  
2 = Ignition coil



TROUBLE-SHOOTING PROGRAM (12)

V

Test ignition-distributor  
assembly adjustment.

N>

Adjust ignition distributor.

Position crankshaft lobe of  
cylinder 1 to TDC.

See upper illustration for marking.

At same time, marking of camshaft  
gear must align with upper edge  
of valve-cover gasket.  
See center illustration, arrow.

Remove cap, distributor rotor  
and dust-protection cover from  
ignition distributor.

Position distributor rotor.

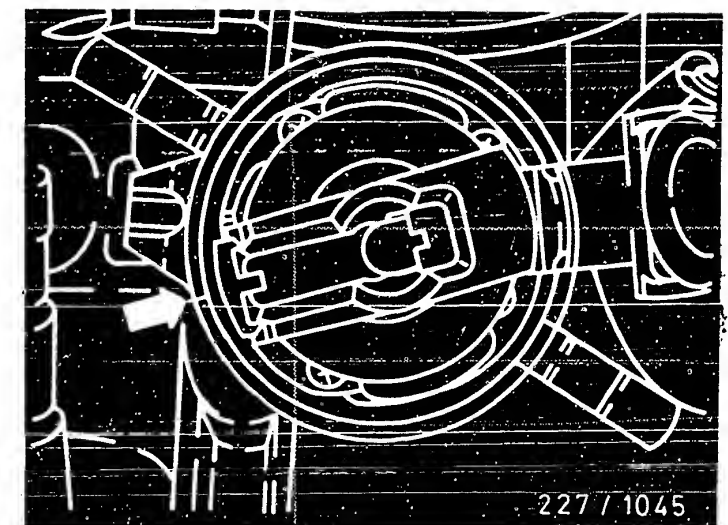
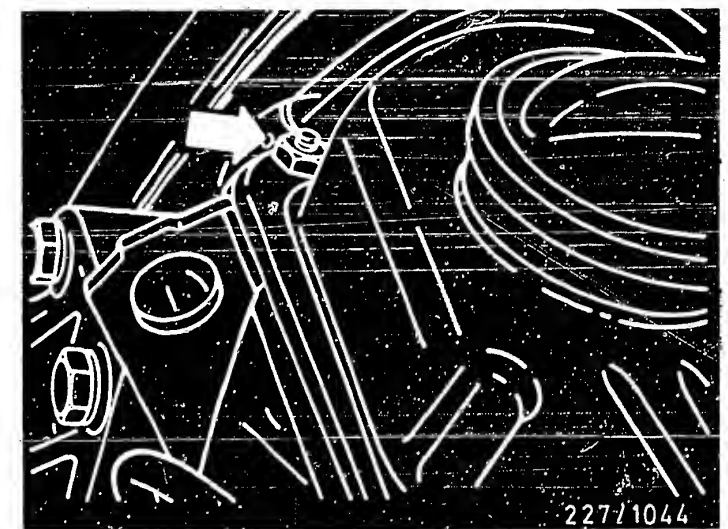
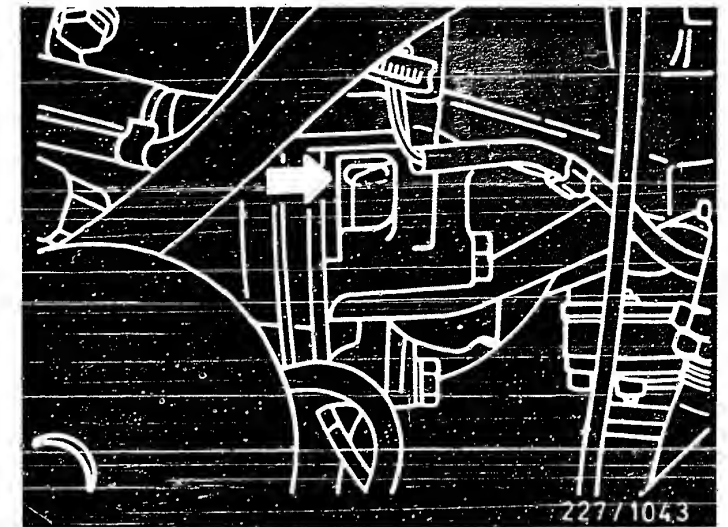
The distributor rotor must  
be positioned so that the  
center of the distributor-rotor  
electrode points towards the  
housing marking of cylinder 1.  
See lower illustration, arrow.

Ignition-distributor adjustment  
O.K.?

Y

V

Return to trouble-shooting chart  
B07



# TROUBLE-SHOOTING PROGRAM (13)

## Test fault lamp.

1. Switch on ignition.  
(Do not start engine.)  
Fault lamp in instrument cluster must light.

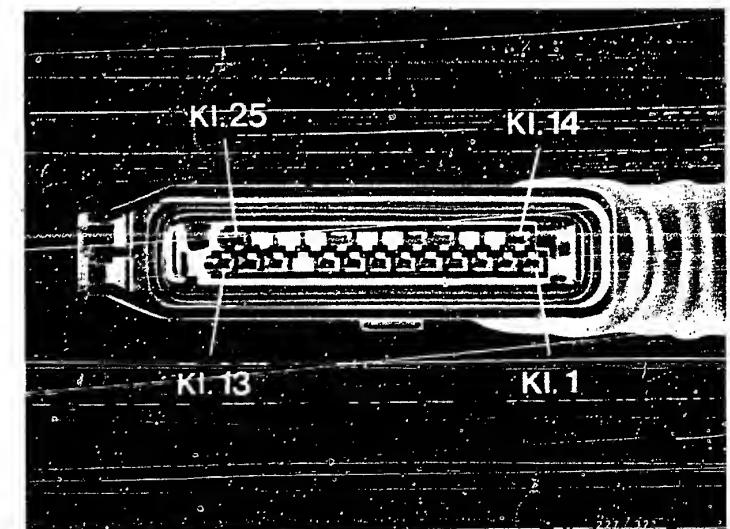
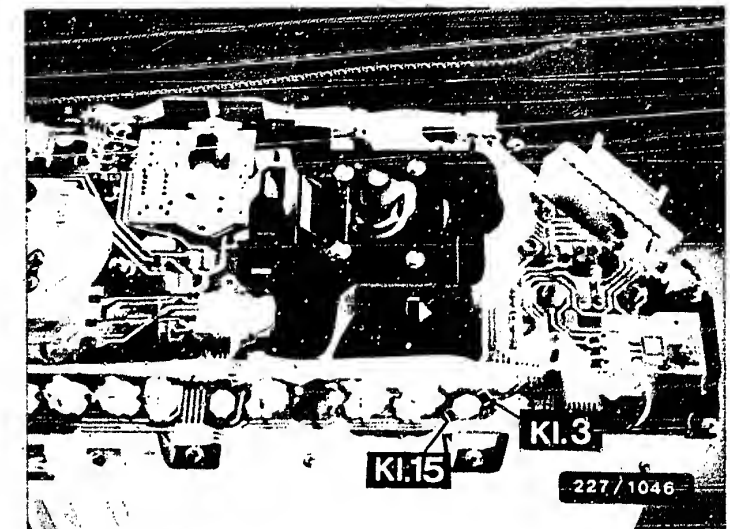
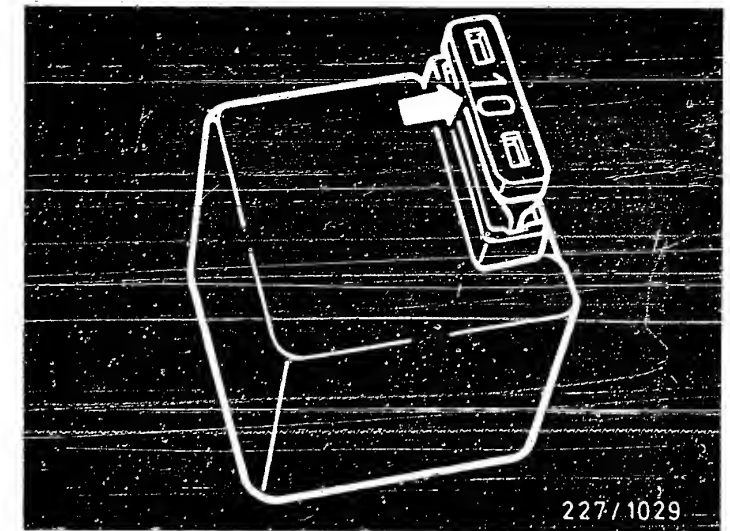
2. Run engine at idle.  
Fault lamp must go out.

Has fault lamp lit up and gone out at idle?

N>

1. Fault lamp does not light.

Bridge contacts at fuel-pump relay w. fuse. See upper illustration, arrow.  
If fault lamp lights, replace EI-K control unit.  
If fault lamp does not light, remove instrument cluster.  
Test fault lamp for proper functioning (12 V).  
If fault lamp was O.K., disconnect EI-K control-unit plug and test lead from ignition and starting switch term. 15 to instrument cluster term. 15 (center illustration) and lead from EI-K control-unit plug term. 3 (lower illustration) to instrument cluster term. 3 for open circuit. Eliminate open circuit.



Return to trouble-shooting chart B07

Continued on next picture page



V

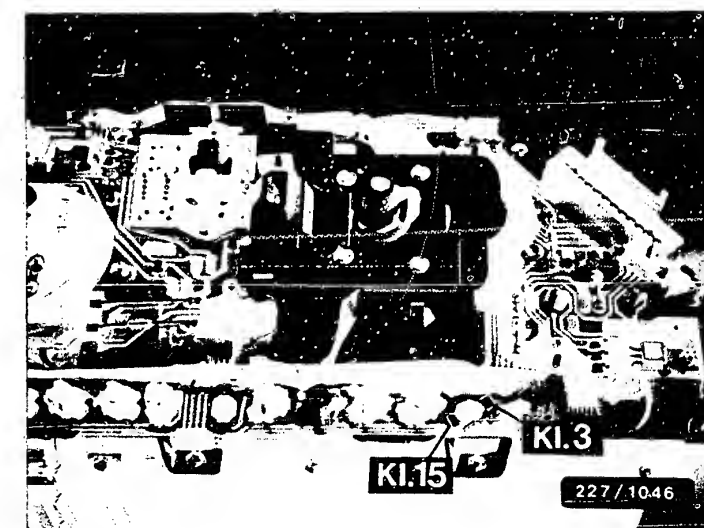
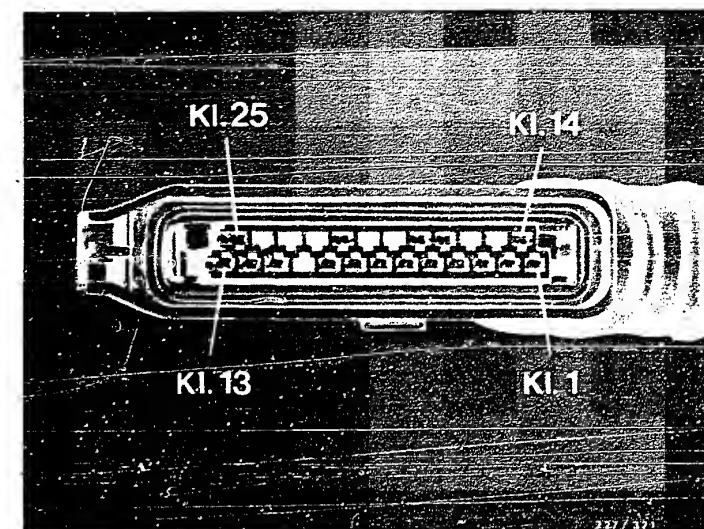
2. Fault lamp lights constantly.

Switch off ignition.

Disconnect EI-K control-unit plug.  
See upper illustration.

If fault lamp no longer lights,  
replace EI-K control unit.

If fault lamp still lights,  
eliminate short circuit to  
ground of fault lamp (lower  
illustration) and/or connecting  
cable term. 3.



Return to trouble-shooting chart  
B07

# TROUBLE-SHOOTING PROGRAM (14)

Test basic ignition setting.

Engine-oil temperature at least 80° °C.

Throttle valve in idle position.

Air conditioner switched off.

Fault lamp must not flash (self-diagnosis O.K.).

Run engine at idle.

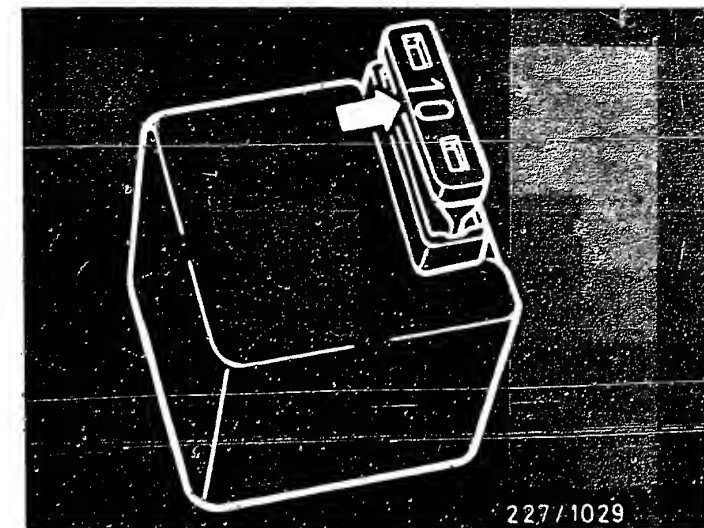
(If testers give clearly wrong reading for engine speed, connect ballast resistor in series and/or convert motortester).

Bridge contacts at electric-fuel-pump relay with fuse (remains bridged until completion of testing). See upper illustration, arrow.

Point timing strobe at ignition-point marking. See lower illustration.

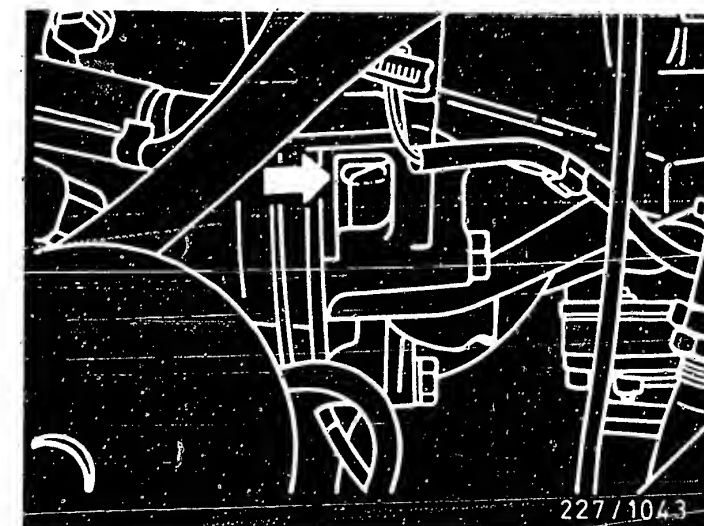
Note:

When using a TDC sensor, make sure that it is inserted into the transmission housing as far as it will go.



Arrow = Electric-fuel-pump relay bridged with fuse.

Arrow = TDC marking



Continued on next picture page

Set value: see brief instructions.

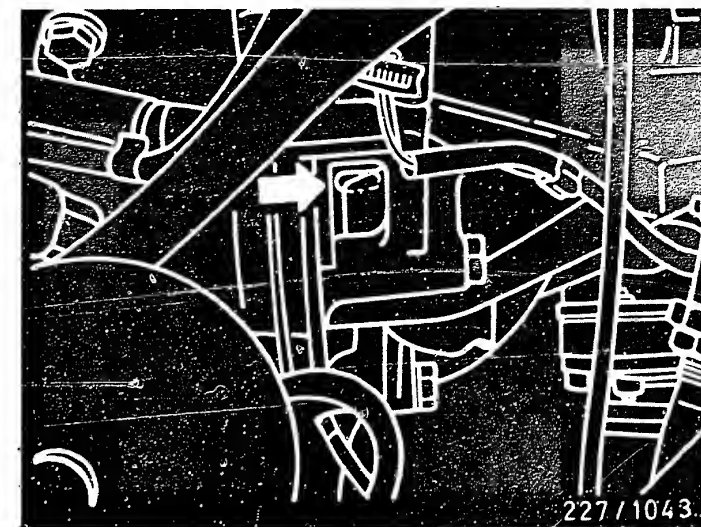
Note:

EI-K control unit does not output a constant test-spark-advance angle until 4 seconds after the contacts at the electric-fuel-pump relay have been bridged.

Ignition-point setting O.K.?

N>

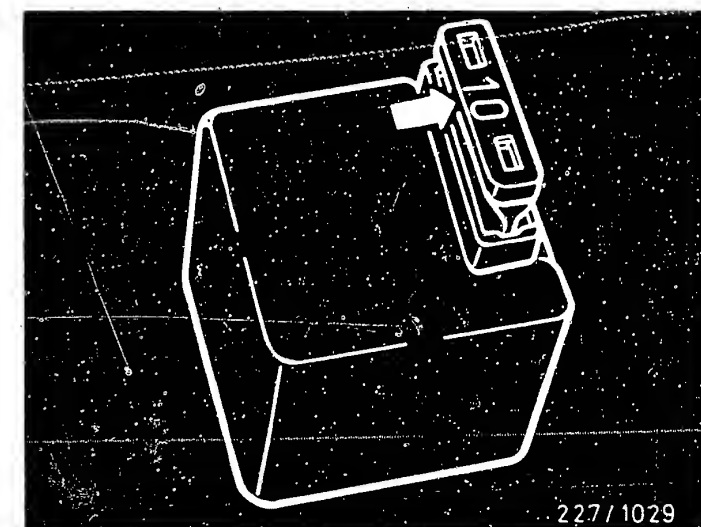
Turn ignition distributor until set value is obtained.



Arrow = TDC marking

Arrow = Electric-fuel-pump relay bridged with fuse.

Disconnect fuse from electric-fuel-pump relay.  
See lower illustration, arrow.



Return to trouble-shooting chart  
B07

# TROUBLE-SHOOTING PROGRAM (15)

Test voltage supply of  
EI-K control unit.

Switch off ignition.

Disconnect EI-K control-unit  
plug and push back handle cover  
after unscrewing the fastening  
screw and removing the sealing  
rubber.

Connect EI-K control-unit plug.  
See upper illustration.

Connect voltmeter to EI-K  
control-unit plug term. 6 (+)  
and term. 20 (-).  
See upper illustration.

Run engine at idle.

Set value: 12...14 V  
may be a maximum 2 V  
below battery voltage.

Is set value obtained?

N>

Disconnect negative and positive  
cables from battery.

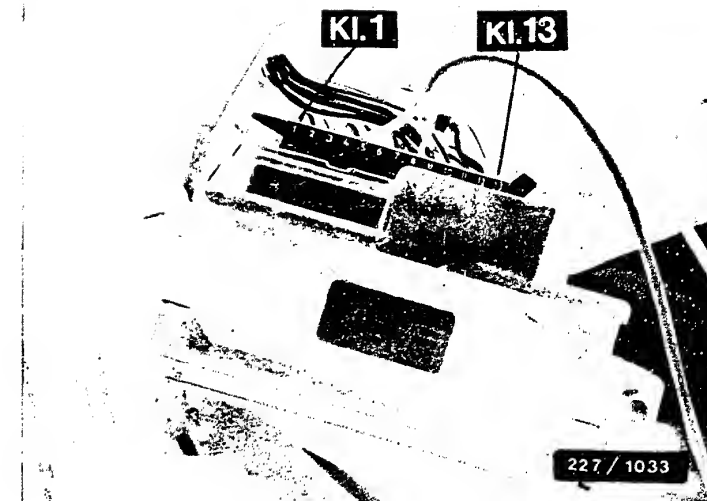
Disconnect EI-K control-unit  
plug.

Switch on ignition.

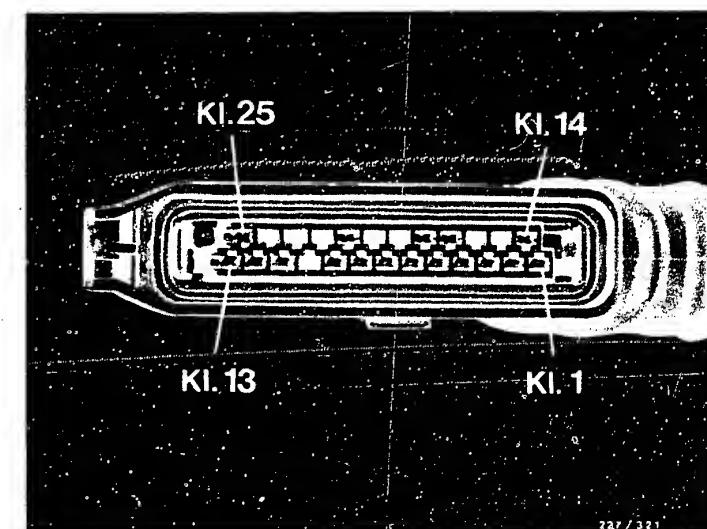
Test leads from positive  
battery terminal to EI-K control-  
unit plug term. 6, including  
leads from negative battery  
terminal to EI-K control-unit  
plug term. 20 for contact  
resistance. See lower  
illustration.

Overall contact resistance:  
max. 0.5  $\Omega$  (Take resistance  
of test lead and test prods  
into account).

Eliminate contact resistance.



EI-K control-unit plug



Return to trouble-shooting chart  
B07

# TROUBLE-SHOOTING PROGRAM (16)

V

Test voltage supply of ignition coil.

N>

Connect voltmeter to ignition coil term. 15 and vehicle ground.  
Run engine at idle.

Set value: equal to/greater than 10 V

Is set value obtained?

Y

Disconnect positive cable from battery.  
Switch on ignition.  
Test leads from positive battery terminal via trigger-box plug term. 1 to ignition coil term. 15 for contact resistance.  
Contact resistance: max. 0.5  $\Omega$ . (Take resistance of test lead and test prods into account.)

Eliminate contact resistance.

V

Return to trouble-shooting chart B07

D23

<==>

D24

<==

# TECHNICAL BULLETIN

DANGER OF ACCIDENT ON SEMI-  
CONDUCTOR IGNITION SYSTEMS

|22|  
VDT-I-227/102 En  
03.1981

Supersedes Feb. 3, 1976 edition

Please be sure to pass this bulletin  
together with VDE 0104/7.67 enclosed on to your  
employees for their attention.

The increased demands made on their ignition  
systems by modern engines, and the wish for freedom  
from maintenance, led some time ago to manufacturers  
starting to equip their vehicles with semi-conductor  
ignition systems as original equipment.

In most cases, the performance of nearly all  
makes of such systems is higher than that of  
conventional systems, and further improvements are  
to be expected. This means that semi-conductor  
ignition systems have reached the point where  
contact with "live" components or terminals  
(whether on the primary side or the secondary side)  
can prove fatal.

In this connection, we should like to point out  
to you that the laws valid in your country  
regarding work on high-voltage systems must  
be adhered to when working on, or testing,  
semi-conductor ignition systems.

As a matter of principle, when working on such  
ignition systems, the ignition is to be  
switched off.

Included in such work are the following operations:

- \* Connection of engine testing equipment  
(timing strobe, dwell-tach tester, ignition  
oscilloscope etc.)
- \* Replacement of ignition system components  
(spark plugs, ignition coil, ignition  
distributor, H.T. ignition cables etc.)

If it is necessary to switch on the ignition  
in order to test the system or make adjustments  
on the engine (to the carburetor, for instance),  
then lethal voltages are present throughout  
the entire system.

This means that the danger of accident exists  
not only at the individual components in the  
system (e.g. ignition distributor, ignition  
coil, trigger box, ignition harness), but also  
at the wiring harness (e.g. connection for the  
tachometer, diagnostic connector), on terminals,  
and on test equipment.

In addition, in the case of the capacitor-discharge  
ignition system (CDI), danger of accident is also  
present under the following circumstances:

- \* Operation of the trigger box without the  
ignition transformer.
- \* At the trigger box, (removed), relatively  
soon after it has been switched off  
(capacitor discharge).

Below is a typical terminal diagram of a semi-  
conductor ignition system, the dangerous  
locations being marked with high-voltage arrows.

We would point out that all semi-conductor  
ignition systems, even the older versions, are  
to be regarded as dangerous in the sense as  
defined by this bulletin.



## EFFECTS OF ELECTRICAL AND ELECTRONIC SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En  
01.1981

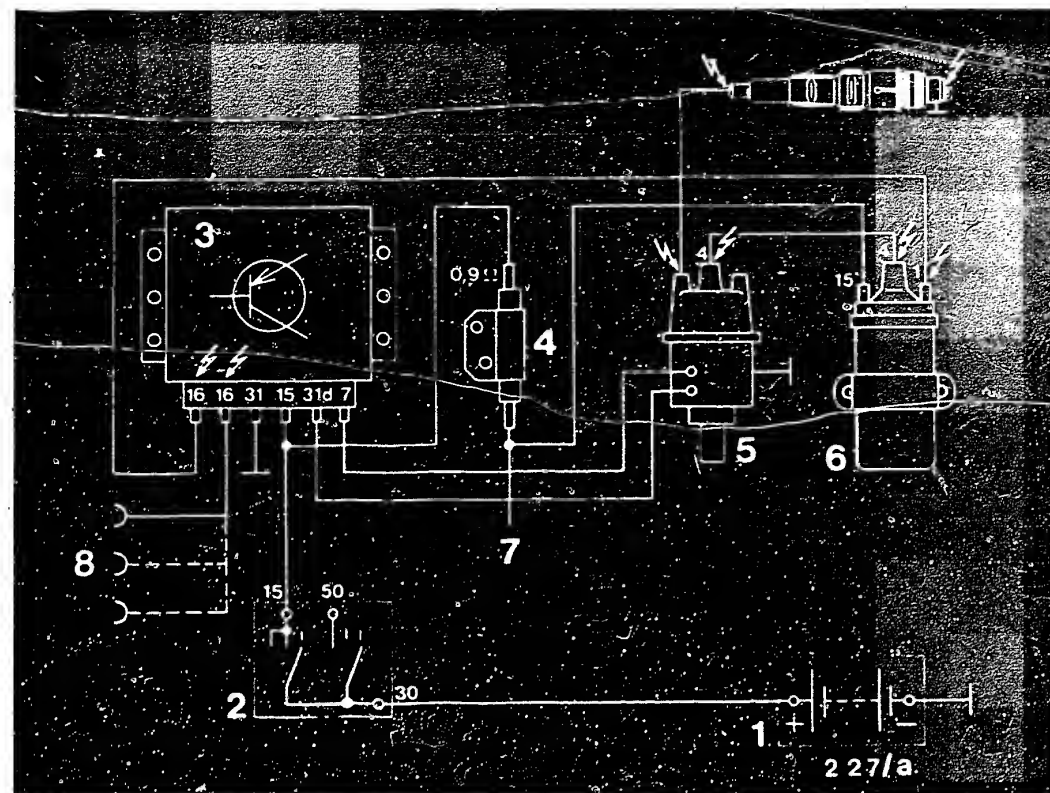
e.g. Ignition systems, Jetronic, Motronic, ABS

Please ensure that this Bulletin is passed  
on to your employees for their attention.

We have often been asked by some of our  
customers whether or not patients with heart  
pacemakers are endangered in any way by  
ignition systems. This theme was recently  
the subject of an examination carried out by  
the Ignition System Development Department of  
Robert Bosch GmbH in conjunction with Dr.  
Thull, lecturer at the Central Institute for  
Biomedical Technology at the University of  
Erlangen-Nürnberg and Biotronic GmbH & Co.  
of Berlin, a manufacturer of heart pacemakers.  
The magazine "Biomedizinischen Technik"  
(5/80) published the results.

The most important discoveries in this practice  
can be summarized from the examination report  
as follows:

1. Heart pacemakers corresponding to the  
latest state of the art are not affected  
by radiation (electromagnetic fields) from  
ignition systems.
2. With a stationary engine and the ignition  
switched off, the heart pacemaker is not  
affected by any part of the ignition system,  
even when unintentionally touched. Main-  
tenance work in the engine compartment, for  
example, can then be carried out without  
any danger.



- 1 = Battery
- 2 = Ignition lock
- 3 = Trigger box
- 4 = Resistor
- 5 = Ignition distributor
- 6 = Ignition coil
- 7 = To starting motor term. 16
- 8 = To tachometer connection  
or diagnostic plug  
or TD connection

Published by:

Robert Bosch GmbH  
Division KH  
After-Sales Service Department for  
Training and Technology (KH/VSK)

Please direct questions and comments  
concerning the contents to our authorized  
representative in your country.

3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency). Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers, please introduce the necessary measures.

We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

Published by:

Robert Bosch GmbH  
Division KH  
After-Sales Service Department for  
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

KNOCK SENSOR 0 261 231 ..

VDT-I-227/110 En  
03:1983

Procedures for after-sales service

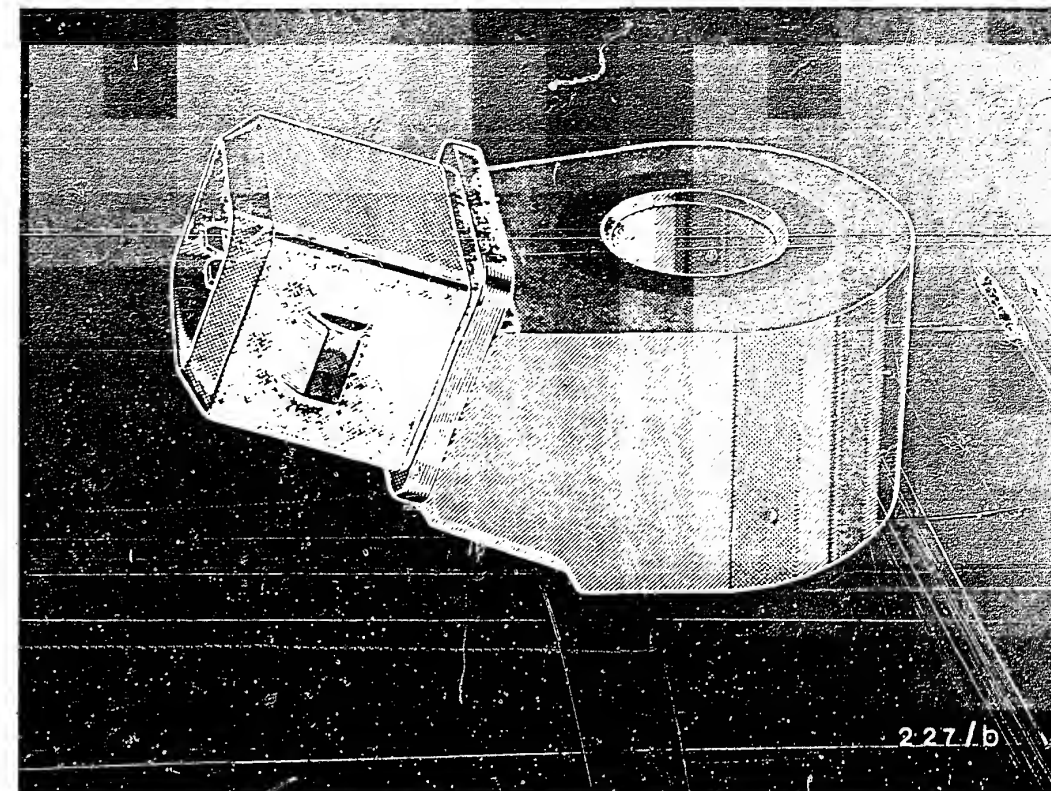
### Description

The knock sensor contains an active piezo-ceramic element.

It is screwed to a chosen position on the engine block and sends a structure-borne signal which is processed further by an electronic control unit.

### User

Saab is the first vehicle manufacturer to use the knock sensor which is being fitted to various turbo vehicles.



### Components

Knock sensor 0 261 231 ..\*

\* The exact part numbers are given on the appropriate vehicle-equipment micro-cards AA... .

### Service/exchange parts

The knock sensor is a service part and is supplied by Bosch.  
The remaining components of the knock control are products made by other firms.

### Technical documentation

Technical Bulletin "New Product"  
VDT-I-227/10.

## Training

Special training is not necessary.

## Retrofitting

The knock sensor is not intended for retrofitting.

## Warranty procedure

Components on which a claim is being made should be sent for inspection during the warranty period to our representative in your country. He should forward it to:

ROBERT BOSCH GMBH  
KH7LAV-Auspackraum  
zur Weiterleitung an K1/VAK2  
7000 Stuttgart 30  
Federal Republic of Germany

This regulation applies until further notice.

## Published by:

ROBERT BOSCH GMBH  
Division KH  
Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

## TECHNICAL BULLETIN

### BREAKERLESS TRANSISTORIZED IGNITION SYSTEM

|22|

Warranty note

VDT-I-227/103 En

Hybrid-construction trigger boxes

0 227 100 100 for ignition dist. with Hall gen. (TCI-h)

0 227 100 102 for ig. dist. with ind.-type pulse gen. (TCI-i)

## Warranty procedure

If the complaints are justified, all these hybrid trigger boxes are to be sent, along with completed warranty documents, to your authorized representative for forwarding to the following address:

ROBERT BOSCH GMBH  
KH/LAV - Auspackraum  
zur Weiterleitung an K1/VAK 21  
D-7000 Stuttgart 30

This instruction remains valid until further instruction.

# TECHNICAL BULLETIN

## NEW DESIGNATIONS FOR IGNITION SYSTEMS

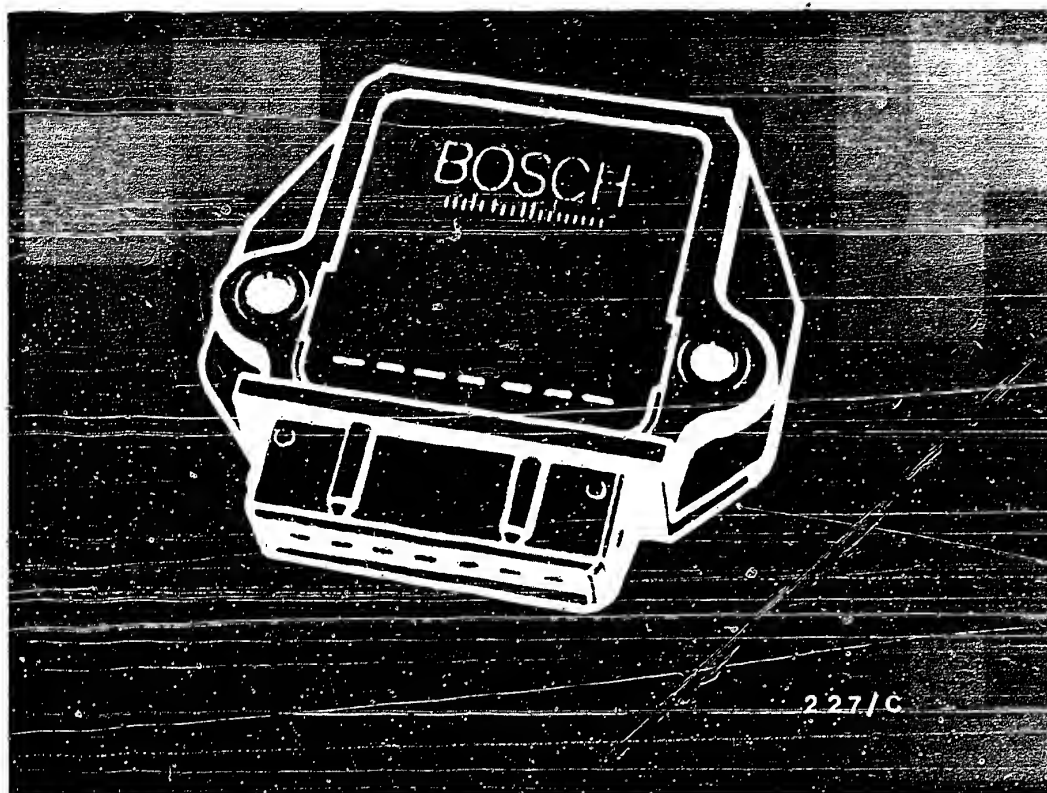
VDT-I-227/108 En  
01.1983

Supersedes 5.1981 edition

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbreviated code	Meaning	Switching	Ignition ctrl. and spark adv.	High-voltage dist.
Coil ignition	ZS (CI)		Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I * (TCI-i)	I=Induction-type pulse gen.	Electronic (trigger box)	Mechanical (ignition dist.)	Mechanical (ignition dist.)
	TSZ-H (TCI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition dist.)	Mechanical (ignition dist.)



Apart from the well-known TCI trigger boxes 0 227 100 0.., trigger boxes of hybrid construction have been fitted as standard since 9.78 (upper illustration).

Published by:

ROBERT BOSCH GMBH  
Division KH

Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

Designation	Abbreviated code	Meaning	Switching	Ignition ctrl. and spark adv.	High-voltage dist.
Transistorized ignition	TZ-I * (TI-i)	I-Induction-type pulse gen.	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in hybrid technique)	TZ-H * (TI-h)	H-Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Breakerless semi conductor ignition with or without knock control	EZ (EI) (EZ-K) (EI-k)	K= Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributor-less ignition with or without knock control	VZ (FEI) VZ-K (FEI-k)	K= Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

\* Note:

The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).

Published by:

Robert Bosch GmbH  
Division KH  
After-Sales Service Department for  
Training and Technology (KH/VSK)

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## MOTOR VEHICLE SERVICE INFORMATION

INCORRECT DISPLAY OF ROTATIONAL SPEED VDT-I-Gen. 030 En  
AND DWELL ANGLE ONLY WITH TRIGGER 02.1981  
BOXES 0 227 100 .. (TCI-i, TCI-h)  
WITH CURRENT LIMITATION Supersedes ed. 6.1980

For additional information, see VDT-I Gen. 032 En

### 1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period, the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT 001.00	Rotational-speed	KTE 001.00
001.01	display O.K. with	001.02
001.02	these testers	001.03
001.04		
002.00		

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan	(Hitachi ignition system)
Fiat	(Delco ignition system)	Datsun	(Bosch ignition system)
Ford	(Delco ignition system)	Peugeot	(Bosch ignition system)
		VW	(Bosch/Fairchild ignition system)
General Motors	(HEI ignition system)	Bosch transistorized ignition system for retrofitting 0 227 100 920	

## 2. Test instructions

### 2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min<sup>-1</sup> to 1200 min<sup>-1</sup>).

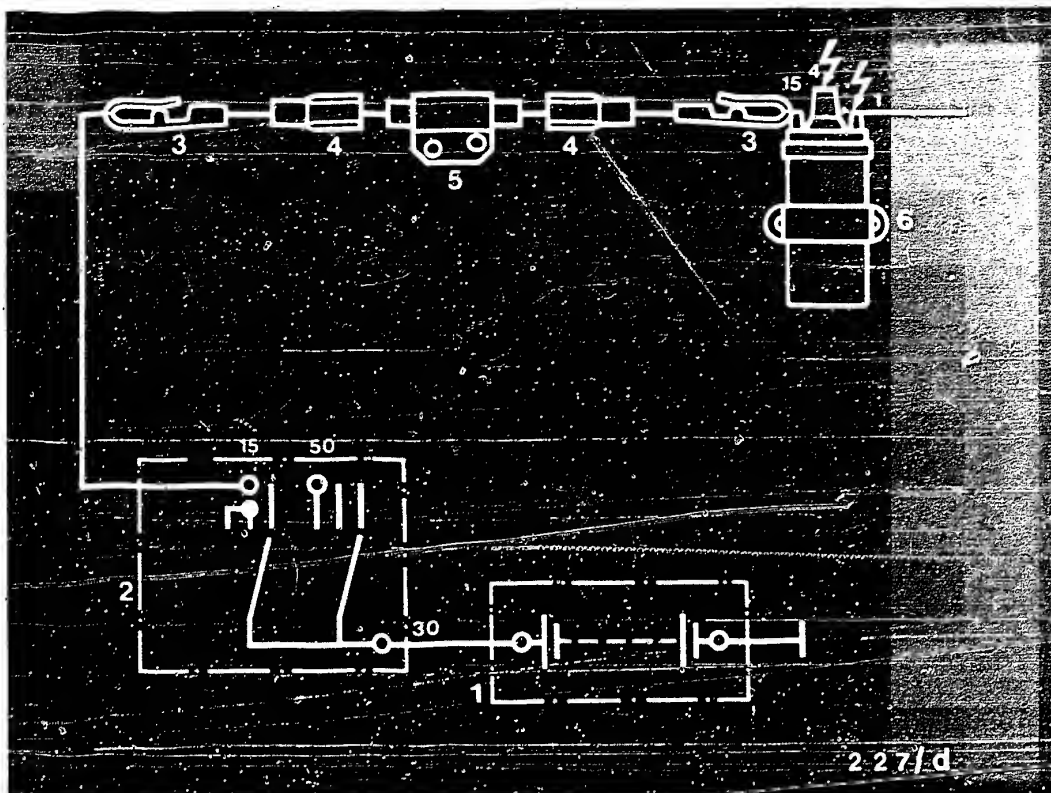
It is, however, possible to attain correct rotational-speed measurements:

Connect a ballast resistor of 0.9 or 1.0 Ohms (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

### Suggestion for user manufacture

#### Required parts:

1 ballast resistor 0.9 Ohms	Part no. 0 227 900 002
or	
1 ballast resistor 1.0 Ohms	Part no. 0 227 900 101
2 blade receptacles e.g. approx. 0.2 m cable, 1.5 mm <sup>2</sup> e.g.	Part no. 1 901 355 881 Part no. 6 210 150 150
2 insulated clips	Commercially available



- |                     |                      |
|---------------------|----------------------|
| 1 = Battery         | 4 = Blade receptacle |
| 2 = Ignition switch | 5 = Ballast resistor |
| 3 = Clips           | 6 = Ignition coil    |

High-voltage arrow: Dangerous voltages  
(400 V – 25 kV)

## 2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

## 2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.

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# MOTOR VEHICLE SERVICE INFORMATION

## MOTORTESTER CONVERSION

VDT-I-Gen. 032 En  
06.1980

Incorrect display of rotational speed,  
dwell angle and ignition point  
only with trigger boxes

0 227 100 .. (TCI-1, TCI-h) with current limitation

For additional information, see

VDT-I-Gen. 030 of 6.80

Re.: Motortesters EFAW 268

268 S 10

269

214 B

AE 2000

## 1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor-vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

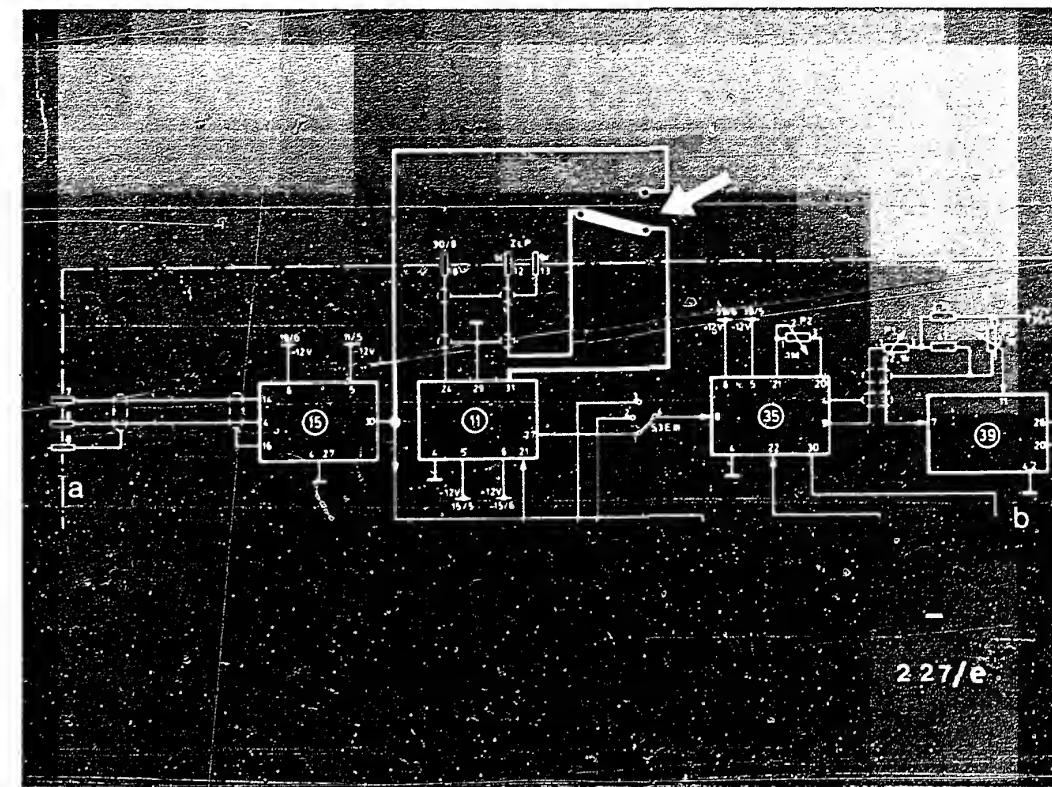
## 2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period, the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system.

There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing strobe is triggered by the signal-path dwell-angle meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

### 3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing strobe is triggered by the clamp-on induction pickup and the pulse shaper stage.

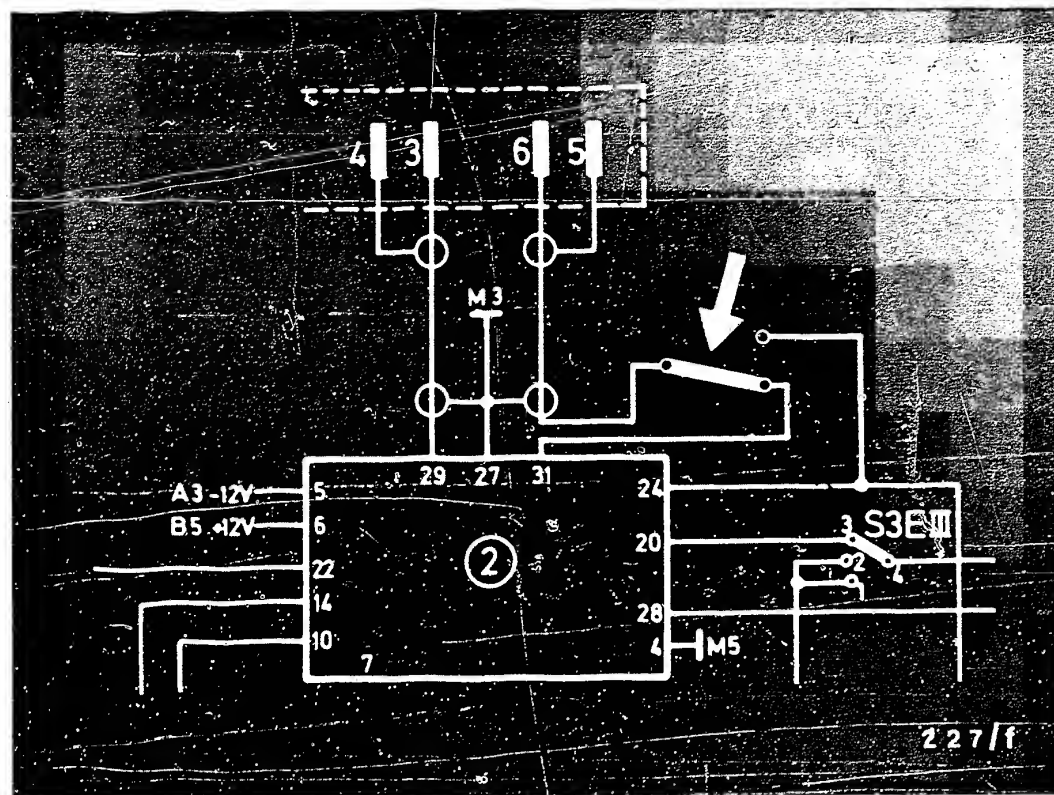


a = Clamp-on induction pickup  
b = (Extract from WJF 508/1, Page 53)

EFAW 268, 268 S 10, 269, AE 2000

Remove the line of the ZLP from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803).

In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact.  
Arrow points to switch with change-over contact.



(Extract from WJF 503/1, Page 64))

#### EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803).

In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact.

Arrow points to switch with change-over contact.

By fitting the switch with change-over contact in the front panel of the motortester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly:

e.g. "Standard" - "Current limitation". These conversion measures have already been published in the K7 information sheet KJF 28/7911.

#### 4. Test instructions

##### 4.1 Standard ignition systems

Switch position: "Standard".

All other tester connections as per operating instructions.

##### 4.2 Ignition systems with current limitation

Switch position: "Current limitation".

In order to trigger the timing strobe, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

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## MOTOR VEHICLE SERVICE INFORMATION

### TESTS ON ELECTRONIC IGNITION SYSTEMS (TCI, TI) TESTER INSTRUCTIONS

VDT-I-Gen. 035 En  
03.1981

The following tests are listed in older  
and current Tester operating instructions  
or in "Trouble-shooting with the oscilloscope":

- \* "Separate ignition coil test"  
(Concerns EFAW 213, 214, 268, AE 2000)
- \* Calculating the "ignition voltage reserve"  
(Concerns EFAW 213, 214, 268, AE 2000  
and MOT series).
- \* "Intensified insulation test"  
(Concerns EFAW 213, 214, 268, AE 2000  
and MOT series).

Nowadays, transistorized ignition systems  
deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition  
cable and ignition distributor by voltage  
flashovers, the tests listed above should  
n o t be carried out on transistorized  
ignition systems.

The contents of this Service Information has  
already been published in the K7 Information  
K7-VJF 17/8012.

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For production reasons:  
continued on the following  
coordinate.

For production reasons:  
continued on the following  
coordinate.

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IMPRESSUM

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